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THE REVIEW
OF
APPLIED MYCOLOGY

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BAECHLER (R. H.). **Toxicity of various fractions of low-temperature coal tar creosote.**—*Proc. Amer. Wood Pres. Ass.*, 49, pp. 12–17, 1953. [Received 1954.]

At the Forest Products Laboratory, Madison, Wisconsin, the tar acids from a low-temperature (up to 270° C.) coal-tar creosote were found to be highly toxic when tested against Madison 517 [*Polyporus tulipiferus*: *R.A.M.*, 34, pp. 9, 334] by the agar flask method. Their toxicity was not reduced by aeration. Most of the neutral oil fractions showed low toxicity, and the distillation residue was moderately toxic.

A washing procedure was devised for use in conjunction with aeration in the artificial weathering of the oils prior to the toxicity test. The oil was stirred for nine hours daily for five days in a Whatman single-thickness 43 by 123 mm. paper thimble immersed in water at 18° C. After this treatment the killing concentration of a high-temperature coal-tar creosote was raised from 0·03 per cent. to 0·07, and that of the low one from 0·1 to 0·2.

BAECHLER (R. H.). **Reports of preservatives committees.**—*Proc. Amer. Wood Pres. Ass.*, 49, pp. 59–86, 1953. [Received 1954.]

In the report of the committee dealing with the revision of the [American Wood Preservers'] Manual it is stated that the use of zinc chloride [*R.A.M.*, 34, p. 119] and zinc meta arsenite [34, p. 332] has declined to negligible amounts.

The committee dealing with the evaluation of wood preservatives reports on a proposed standard method for field tests [cf. 34, p. 331] with stakes and stobs (round posts less than 6 in. in diameter and 5 ft. or less in length). It is recommended that all test specimens shall be earthed in as short a time as possible after treatment, with stobs and 2 by 4 in. stakes 2 ft. apart, 3 ft. between the rows, and inserted to a depth of 18 in., and smaller stakes ($\frac{3}{4}$ in. squares) at least 1 ft. by 18 in., and 9 in. deep. Old test ground may be re-used if different holes are made. No toxic chemical should be applied to control vegetation, and after each inspection specimens must be re-earthed to their original depth and the soil pressed down. Rules are also laid down for treatment, after-treatment handling, inspection, and evaluation of results.

FINDLAY (W. P. K.) & SAVORY (J. G.). **Moderfäule. Die Zersetzung von Holz durch niedere Pilze.** [Soft rot. The decay of timber by the lower fungi.]—*Holz a. Roh- u. Werkst.*, 12, 8, pp. 293–296, 6 figs., 1954.

Healthy-looking timber exposed to a moist climate for a length of time softens, and the softening of the surface occurs more often in deciduous than in coniferous wood. The phenomenon is often dismissed as 'weathering' and ascribed to climatic agencies. Microscopic inspection, however, shows that fungi are present. The rot is usually only a few mm. deep, and usually economically unimportant. It occurs, however, on the surface of wooden boards in water-cooling towers [*R.A.M.*, 34, p. 414]. The average lifetime of the wood filling of a cooling-tower is 20 years,

but sometimes renewal may be necessary after 10 years. Since each filling consists of 450 to 500 cu. m. of good wood, this poses an economic problem. The affected surface of such timber darkens and softens, and readily disintegrates. When dried, the softened layer splits, which gives the timber a slightly burnt appearance. This decay spreads more slowly than that due to basidiomycetes, and remains superficial. Of the moulds isolated from cooling-tower boards and other woods, the following caused soft rot [? of beech wood blocks] under laboratory conditions: *Chaetomium globosum* [loc. cit.] and other *C.* spp., *Trichurus terrophilus*, *Bispora effusa*, and certain species of *Stysanus* [33, p. 501], *Stemphylium* [33, p. 290], and *Coniothyrium* [33, p. 369].

It is characteristic of the soft rot that the hyphae attack the secondary cell walls leaving the middle lamella intact. The innermost layer of the wall is equally resistant. In more thick-walled elements of the late-formed wood decay is particularly severe. Protection against soft rot is afforded by copper-containing preservatives. Further investigations, however, will be needed to elaborate effective methods of protection. For plywood the best method seems to be impregnation with artificial resin.

HENDERSON (F. Y.). **Report of the Director of Forest Products Research for the year 1953.**—*Rep. For. Prod. Res. Bd, Lond., 1953*, pp. 6–53, 8 pl., 6 graphs, 1954.

In the mycology section (pp. 32–36) of this report [cf. *R.A.M.*, 33, p. 571] it is stated that a new metabolic product of *Daedalea juniperina* has been isolated. Investigations on the rotting of beech wood by *Stysanus* sp. have been facilitated by the fact that the hyphae bind decayed wood fibres together. It was confirmed that increased amounts of inorganic salts in an agar medium supporting growth of *Chaetomium globosum* accelerated the decay of beech wood in contact with the culture [loc. cit.]. Californian redwood [*Sequoia sempervirens*] filling timbers in a water-cooling tower at Bulawayo, Southern Rhodesia, were affected by a bacterial soft rot [cf. 34, p. 414].

Laboratory tests on seven proprietary wood preservatives used for surface application indicated that at least two brush treatments are necessary for effective protection.

In further investigations in co-operation with the Building Research Station the growth of *Merulius lacrymans* on test blocks of mortar [33, p. 571] was effectively prevented by ethyl mercury phosphate and by calcium pentachlorophenate incorporated in a polyvinyl emulsion paint.

Many of the timbers in H.M.S. Victory were found to have a moisture content high enough for fungal growth [see next abstract].

Some organic tin compounds were toxic to sap-stain fungi in tests with sapwood disks. The fungus isolated most frequently from stained tropical hardwoods was *Lasiodiplodia* [*Botryodiplodia*] *theobromae* [cf. 19, p. 379], *Diplodia natalensis* [cf. 29, p. 548] occurring to a lesser extent.

In a field experiment to determine the value of antiseptic spraying and end coating to prevent deterioration of hardwood logs prior to conversion, little decay was observed in logs sprayed with creosote or 5 per cent. sodium pentachlorophenate and with the ends coated with a bituminous paint. The untreated logs were decayed largely by *Stereum purpureum* [cf. 33, p. 572], and *Hypoxylon coccineum* [cf. 23, p. 155] was isolated from dark zones in the wood.

SAVORY (J. G.) & PACKMAN (D. F.). **Prevention of decay of wood in boats.**—*Bull. For. Prod. Res., Lond.* 31, iv+18 pp., 8 pl., 1954.

Descriptions are given of the chief fungi responsible for decay in wooden boats [see preceding abstract] (*Coniophora cerebella* [*C. puteana*: *R.A.M.*, 31, p. 262] and

Poria spp. [loc. cit.]) and of the types of decay they produce. Attack is favoured by the use of unseasoned timber, of sapwood, which is generally more susceptible than heartwood, or of the heartwood of timbers with low resistance; by the presence of fresh water from leaks; and by inadequate ventilation. The resistance to decay of the heartwood of some timbers used or proposed for use in boats is tabulated. The most suitable preservatives for non-durable timber are the solvent ones which can be applied by soaking, dipping, or brush treatments [cf. 33, p. 571]. Pressure treatment of the more permeable timbers, coupled with brush application to the cut surfaces and treatment of bolt-holes, gives very effective protection.

A brief section (pp. 15–17) describes the symptoms, cause, and prevention of electrochemical attack in boat timbers, due to dissimilar metals in contact with the same piece of moist wood, and how to differentiate this attack from fungal decay.

SMITH (D. N.). **Field tests on wood preservatives used for pressure treatment.**—*Bull. For. Prod. Res., Lond.* 32, 52 pp., 1 pl., 1 diag., 1954.

The results from 1929 to 1953 are summarized of 'graveyard' field tests, still in progress at Thetford, Norfolk; Dolgelly, North Wales; and Princes Risborough, Bucks., using about 20 different timber preservatives on blocks of oak, beech, Scots pine, and Douglas fir (*Pseudotsuga taxifolia*), 4 by $2\frac{1}{4}$ by 2 ft.

Less than 1 per cent. of the blocks treated with high-temperature creosotes have failed in 24 years, but the low-temperature creosotes, particularly crude coal oil, have not given such good results. Mixtures of creosote and fuel oil are effective only when they contain at least 50 per cent. creosote. All the more modern water-soluble mixtures tested are proving effective, ascu ($2\frac{1}{4}$ and $4\frac{1}{2}$ per cent.), celcure ($5\frac{3}{4}$), and tanalith (4) giving good results. Tanalith and triolith appear to be most effective on the softwoods.

These results are tabulated, and shown in more detail in an appendix (pp. 17–45), a further appendix (pp. 46–52) giving the compositions and sources of the preservatives under test.

FINDLAY (W. P. K.) & BADCOCK (E. C.). **Survival of dry rot fungi in air-dry wood.**—*Timb. Technol.*, 62, pp. 137–138, 1954.

Experiments at the Forest Products Research Laboratory, Princes Risborough, on the survival of dry rot fungi in air-dry wood [*R.A.M.*, 30, p. 352] have now established that *Lenzites trabea* and *L. sepiaria* can live for at least nine years in wood containing only 12 per cent. moisture. *Merulius lacrymans* [loc. cit.] did not survive for more than 30 weeks in air-dry test blocks (2 by $1\frac{3}{4}$ by $1\frac{3}{4}$ in.) of Sitka spruce, and it is concluded that the fungus may be destroyed by keeping infected timber dry for six months or more.

EDWARDS (W. A.). **The decay of timber and its prevention.**—*J. Oil Col. Chem. Ass.*, 37, 414, pp. 655–665, 4 figs., 1954.

Useful information is presented on some well-known wood-destroying fungi occurring on standing trees and structural timbers in England; the conditions promoting their development; and the assay of preservatives, with special emphasis on the wood-block test. The properties requisite in an ideal preservative are briefly examined in relation to the performance of some materials in current use, e.g., creosote [*R.A.M.*, 34, p. 501], copper naphthenate, and sodium fluoride. All three possess most of the necessary attributes, but creosote tends to be unduly volatile, is difficult to paint over, and has a disagreeable odour. Copper naphthenate also smells unpleasant (this might be remedied by the substitution of ethylhexoic for naphthenic acid), and treated wood is liable to blister on exposure to hot sunshine; the price, too, is high. The only objection (a serious one) to sodium fluoride is leaching out under very wet conditions.

LINDGREN (R. M.). **An overall look at wood deterioration.**—*Rep. For. Prod. Lab., Madison*, 1966, 6 pp., 1953. [Mimeographed.]

In this report of a talk given to the Northeastern Wood Preservation Conference, New Haven, Connecticut, on 15th September, 1953, the deterioration problems associated with various kinds of timber used for different purposes are discussed. It is estimated that the annual losses from fungal deterioration of wood amount to $300,000,000 [? in the United States only], excluding the cost of preservative treatments and other preventive measures.

BLEW (J. O.). **Wood preservatives.**—*Rep. For. Prod. Lab., Madison.* D 149, 12 pp., 1953. [Mimeographed.]

In this revised edition of a previous report [*R.A.M.*, 21, p. 112] brief descriptions are given of coal tar creosote and other wood-preserving oils, water-borne preservatives, paints, varnishes, and water-repellent preservatives.

NEUMANN (P.). **Krankheiten der Keimlinge und Jungpflanzen unserer Kohlgewächse.** [Diseases of seedlings and young plants of our Brassicae.]—*Pflanzenschutz*, 7, 3, pp. 39–44, 3 figs., 1955.

The life-histories of *Pythium debaryanum*, *Rhizoctonia* [*Corticium*] *solani*, *Moniliopsis aderholdi*, and *Olpidium brassicae*, all responsible for damping-off of cabbage and other brassicae in Bavaria, Germany [*R.A.M.*, 31, p. 584], are summarized and their effects briefly described. The first step towards control is the provision of favourable cultural conditions. The soil should be rich in humus and of a loose texture, sand or peat being added if required. High-quality seed of good germinability is indispensable and should be sown sparsely in moderately moist, well-aerated soil. Should the disease appear stringent precautions must be taken to prevent its transmission by means of soil, insufficiently rotted compost, infected irrigation water, or contaminated seed- and transplanting-boxes, or garden tools. Only steamed or chemically treated soil should be used in propagating- and forcing-frames. The admixture with the soil of substantial quantities of peat or the incorporation of finely sifted, thoroughly slaked coke ash are also helpful in the control of the disease. The presence in the soil of large amounts of cabbage refuse is deprecated and may cause rotting of the cotyledonary or primary leaves. Good control of damping-off has been effected by soil treatment with brassicol and hortizol, while dusting the seed and frequent watering with a mercurial solution are also recommended. Soil already used for propagation must be sterilized before being used again. Very important also is the disinfection with a dilute formalin solution of seed- and transplanting-boxes, walls and windows of forcing-frames, and any implements that have been in contact with the soil.

Information is presented on the symptoms of club root, to which cauliflower is particularly susceptible, and the life-cycle of the causal organism, *Plasmodiophora brassicae* [29, p. 205; C.M.I. map No. 101]. It attacks not only all crucifers but a number of plants belonging to quite different families, e.g., corn poppy [*Papaver rhoeas*], mignonette [*Reseda* sp.], nasturtium [*Tropaeolum majus*], and grasses, e.g., cocksfoot [*Dactylis glomerata*] and rye grass [*Lolium perenne*]. On the other hand, peppermint is reported to be definitely antagonistic to the pathogen, almost or entirely eliminating it in the course of one to three years' cultivation. After harvesting the crop the stalks and roots should be eradicated and burnt or buried deeply; on no account must they be used as compost or fed to livestock since the resting spores survive lengthy periods on the rubbish-heap and pass through the intestinal tract without loss of viability. Field implements, boots, and so on should be thoroughly cleansed after use to obviate the transmission of infection by adhering soil. Damp sites should be drained and aerated and acid or neutral soils

brought to alkalinity by liming or treatment with physiologically alkaline fertilizers, e.g., basic slag, calcium cyanamide (which is particularly advantageous), or stable manure. Brassisan [*R.A.M.*, 31, p. 26] may be strewn over the ground at the rate of 40 to 50 gm. per sq. m. or 2·5 gm. applied per plant hole; for field plantings a dosage of 2 to 2·5 kg. per ha. is indicated. Where steam sterilization is impracticable, brassisan or formalin should be used in propagating-beds exposed to the risk of infection. In transplanting operations any plants with the slightest symptoms of club root should be discarded. Rotation should be arranged in such a way as to leave the maximum possible period between cruciferous crops.

A short account is given of cabbage downy mildew (*Peronospora brassicae*) [*P. parasitica*], which may be combated by the destruction of infected debris, steaming of propagation soil, sparing irrigation, and plentiful aeration, supplemented by frequent applications of a copper spray.

Other fungi attacking brassicae in early growth include *Fusarium* spp., generally of little importance locally; *Phoma lingam*, which tends to cause heavy losses under conditions favouring its development and may be eliminated by hot-water treatment of the seed combined with field sanitation; and *Botrytis cinerea*, a facultative parasite on sickly plants in an unduly warm and humid atmosphere.

Turnip mosaic virus [31, p. 369], which is pathogenic to colza and rape as well as turnip, is transmitted principally by *Lygus pratensis*. The incidence of infection may be reduced by late sowing and the avoidance of simultaneous planting of the above-mentioned crops, which provide an uninterrupted sequence of hosts for the virus.

Cauliflower mosaic virus [31, p. 370], occurring on cauliflower, white and red cabbage, Brussels sprouts, and kohlrabi, is also preventable by timely sowing, while lindane (gamma [–BHC]) or phosphoric acid ester sprays may be applied weekly to the seed-bed.

Full directions are given for steam sterilization of the soil with various types of apparatus, maintaining a minimum temperature of 95° C. for about half an hour. A much cheaper and simpler method consists in watering with formalin at a concentration of ¼ l. in 10 l. water per sq. m., followed by covering with damp sacks for several days to prevent premature evaporation. Mercurials may also be used at a strength of 10 gm. in 3 to 10 l. water or in dust form (50 gm. mixed with 10 cu. m. seed-bed soil), allowing at least three weeks to elapse before sowing. Good results have also been obtained with copper sprays at concentrations of 1 and 0·3 per cent. for preparations with 15 to 18 and 45 per cent. copper contents, respectively, using 1 to 2 l. per sq. m. Calcium cyanamide (80 gm. per sq. m.), preferably mixed with sand or dry earth, should be evenly worked into the propagation soil for a depth of 15 cm.; the seed may be sown 12 to 14 days later in the hotbed or under glass or after three weeks in the open. Soil for hotbeds may be partially disinfected during the winter by the incorporation of 3 to 5 kg. calcium cyanamide per cu. m., turning the soil frequently. Seed should not be sown for at least 10 days after the treated soil has been transferred to the bed. Peat rapid compost, which exerts a measure of control on diseases in general, consists of 75 kg. peat mould, 5 kg. cyanamide, 7 kg. basic slag or 5 kg. Rhenania phosphate, and 7 kg. potash magnesia (or 4 kg. potassium sulphate), saturated with water. A heap is prepared in the late summer, turned at monthly intervals (longer during the winter), re-covered with soil each time, and is ready for use in the spring.

Campbell (L.). **An economical control of black root of Cauliflower.**—*Plant Dis. Reptr*, 38, 12, p. 859, 1954. [Multilithed.]

At Puyallup, Washington, trials were carried out for the control of cauliflower damping-off (*Corticium solani*) [cf. *R.A.M.*, 17, p. 503; 33, p. 628] with pentachloronitrobenzene [cf. 33, p. 697] either rototilled into the soil (2 in. deep) at 50, 100,

and 150 lb. per acre or applied as a soil-surface treatment at 10, 20, and 30 lb. before sowing. Although good results (over 90 per cent. average reduction in disease compared with the untreated) were obtained with both methods of treatment at all concentrations, with no adverse effect on the plants, the latter method was slightly better, giving reductions of 97·86, 96·64, and 97·86 per cent. for the three concentrations, respectively.

Channon (A. G.). **Damping-off and wirestem of Brassica seedlings.**—*Rep. nat. Veg. Res. Sta., Warwick, 1953*, pp. 16–17, 1954.

An outbreak of damping-off and wirestem disease of cauliflower seedlings under glass at the National Vegetable Research Station, Wellesbourne, Warwickshire, in the spring of 1953, was found to be caused by a *Rhizoctonia* sp. Some control of both pre- and post-emergence damping-off was obtained by soil treatment with 1:4,000 mercuric chloride.

Tomlinson (J. A.). **Crook root of watercress.**—*Rep. nat. Veg. Res. Sta., Warwick, 1953*, pp. 14–15, 1954.

Observations on the incidence of crook root disease [*Spongospora* sp.] on a number of watercress farms in Great Britain [cf. *R.A.M.*, 33, p. 5] indicated that it is affected by the nature of the water-supply; for example, healthy plants were found growing in the vicinity of artesian boreholes in the middle of beds in which most of the other plants were dead or severely diseased. Laboratory experiments demonstrated that the disease hardly attacked plants grown in water from local streams (near Wellesbourne, Warwickshire), whereas it developed rapidly in distilled water.

Keyworth (W. G.) & Howell (J. Sheila). **Silvering disease of Red Beet.**—*Rep. nat. Veg. Res. Sta., Warwick, 1953*, p. 15, 1954.

During 1953 the average incidence of silvering disease [*R.A.M.*, 33, p. 6] in the red beet variety Cheltenham Green Top, sown in four affected fields in south-east England and at the National Vegetable Research Station, Wellesbourne, and planted out at the Station, was 20 per cent., the disease occurring to a lesser extent in Cheltenham Vigour and Detroit red beets and in mangolds. When 100 stecklings, grown from seed from healthy or silvered Cheltenham Green Top plants, were planted together, all remained healthy with the exception of nine plants grown from 'silvered' seed. The disease was transmitted by tap root grafts, indicating that it is caused by a virus; no aphid transmission could be demonstrated. Surveys of commercial root crops revealed that approximately one plant in every 10,000 was silvered [cf. loc. cit.].

Björling (K.). **Yellowing in Beets caused by magnesium deficiency.**—*Socker*, 8, 12, pp. 147–156, 6 col. figs., 1954.

Magnesium deficiency of sugar beets [cf. *R.A.M.*, 33, p. 698] is stated to be fairly widespread in some parts of the province of Scania, Sweden. The first symptoms usually appear during the latter part of July in the form of narrow, pale yellow borders on the foliage, particularly near the tips of older leaves. The leaf blades are abnormally thick and curly at the edges. By the end of a week or so the chlorotic margins have expanded into large, pale lemon-yellow, occasionally dark yellow or orange lobes oriented towards the midrib and situated between or across the side veins. Simultaneously with the inward extension of the chlorosis, black or blackish-brown, necrotic streaks and spots develop along the margins and subsequently tend to spread centripetally, more or less completely covering the yellow areas. The dark-coloured tissue is so thin and brittle that it breaks at a touch or from wind action, imparting a crimped and ragged aspect to the leaves. Among

other differences between the symptoms of magnesium deficiency and those of beet yellows virus [25, p. 533] are the irregular spacing and brighter yellow coloration of the chlorotic zones, sometimes covering the entire leaf, in the latter disease, and the triangular or kidney-shaped form of the leaves in the former.

The analysis at the Royal Agricultural College, Uppsala, of leaf and soil samples collected in the late summers of 1951 to 1953 from 21 fields in south and central Sweden, together with a few from Belgium, revealed abnormally low magnesium contents. Thus, in typically chlorotic leaves the magnesium content ranged from 0·1 to 0·3 per cent. of the dry substance, the corresponding values for symptomless plants in the same field and for healthy ones in fields without magnesium deficiency being 0·3 to 0·8 and 0·8 to 1·1 per cent., respectively. The magnesium contents of the foliage of plants suffering from yellows virus and downy mildew [*Peronospora schachtii*: C.M.I. map No. 28] were also analysed. The former disease was accompanied by a statistically significant reduction, which would not in all cases, however, be great enough to cause visible magnesium deficiency symptoms, though in other plants these might well be present. On the contrary, the leaves of plants attacked by *P. schachtii* were slightly higher in magnesium than those of healthy plants.

In one test in 1952 the foliage and root weights of magnesium-deficient plants were reduced by 34 and 37 per cent., respectively.

Bennett (C. W.). **Sugar-Beet yellows in California.**—*Sug. Beet Bull.*, 19, 2, pp. 10–11, 2 figs., 1955.

Following an account of the present status of the viroses of sugar beet, with special reference to beet yellows virus, the author reports the results of experiments in California [*R.A.M.*, 32, p. 228] to determine the effect of the disease on yield and sugar content. In 1952 half the plots in two fields in the Salinas Valley were treated repeatedly with insecticides to control the aphid vectors of the virus (chiefly *Myzus persicae*) and reduce natural infections, while the remainder were left untreated. In the former test the sucrose content was reduced by 7·8 and in the other by 39·7 per cent. The yield did not fall appreciably in the one series of plots but in the other there was a decrease of over 12 tons per acre. In the trials at Riverside in 1953 and 1954 a comparison was made between the performance of healthy plants and those inoculated with a very severe strain of the virus. The sucrose content of the beets was reduced by 35·8 and 45·3 per cent., respectively, in the two seasons, while the average yields sank from 28·815 to 18·738 and from 38·789 to 24·360 tons per acre, respectively.

Hubbeling (N.). **Ziekten en beschadigingen van Bonen.** [Diseases and injuries of Beans.]—*Meded. Inst. plziektk. Onderz. Wageningen* 83, 80 pp., 32 col. pl., 10 figs., 5 graphs, 1955. [English summary.]

This important monograph, illustrated by excellent water-colour plates with explanatory notes in Dutch and English, comprises essential information on the diseases, pests, and physiological disorders of beans (*Phaseolus vulgaris*) in Holland. In the aggregate these agencies are responsible for the loss of over 5 per cent. of the annual yield, which can only be reduced if commercial growers are equipped with the necessary knowledge of their causes.

A contribution dealing with the three viroses, 'roll' mosaic (*Phaseolus* virus 1) [bean mosaic virus], 'severe' mosaic (*Phaseolus* virus 2) [bean yellow mosaic virus], and stipple streak (*Nicotiana* virus 11) [tobacco necrosis virus], and halo blight (*Pseudomonas* [*medicaginis* f.sp.] *phaseolicola*) has already appeared [*R.A.M.*, 32, p. 229]. The only other bacterial pathogen is *P. syringae* [cf. 26, p. 41]. The two most destructive fungal diseases are rust (*Uromyces phaseolicola* var. *typica*) [*U. appendiculatus*: C.M.I. map No. 290] and anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, 33, p. 9], the losses from which are roughly estimated to cost

growers Fl. 200,000 and 350,000 per annum, respectively. There are at least two physiologic races of *U. appendiculatus* and several of *C. lindemuthianum* in the country, a fact which greatly complicates the quest for sources of resistance. *Phaseolus lunatus* var. *macrocarpus* and *P. acutifolius* are also susceptible to anthracnose. Severe damage may further be caused in rainy seasons by *Ascochyta boltshauseri* and *A. phaseolorum* [27, p. 456], *Botrytis cinerea*, and *Sclerotinia sclerotiorum* [30, p. 56], while *Pleospora herbarum* and *Fusarium oxysporum* f. *phaseoli* are of minor importance.

Beans are also affected by deficiencies of potassium, magnesium, manganese, copper, phosphorus, and nitrogen and excesses of manganese and sodium chloride, as well as by adverse climatic factors, including unduly strong sunlight, extremes of heat and drought, cold, frost, and hail, and rough winds.

KATZNELSON (H.), SUTTON (M. D.), & BAYLEY (S. T.). **The use of bacteriophage of Xanthomonas phaseoli in detecting infection in Beans, with observations on its growth and morphology.**—*Canad. J. Microbiol.*, 1, 1, pp. 22–29, 2 pl., 1 graph, 1954. [Received 1955.]

At the Department of Agriculture, Ottawa, the specific bacteriophage for *Xanthomonas phaseoli* was used in the rapid phage-plaque count technique [*R.A.M.*, 32, p. 616], with certain modifications, for detecting the blight pathogen in bean seed [*Phaseolus vulgaris*]. Each surface-sterilized sample of 75 bean seeds was ground and suspended in 300 ml. nutrient broth; 10 ml. of each sample was inoculated with from 4,000 to 8,000 phage particles, and the procedure followed as already described [30, p. 363]. Infection of the seed sample with *X. phaseoli* was established if a significant increase occurred in the number of plaques over the number added to each flask. The phage was absorbed specifically only by cells of *X. phaseoli* and the process was unaffected by overgrowth of contaminating bacteria in the test cultures. Both phage and sample required an incubation period of 24 hours. Fifty per cent. of 75 samples tested were found to be infected by *X. phaseoli*. Electron microscope studies of the phage revealed a particle with a dense head 60 mμ in diameter and a tail 170 to 190 mμ long and 10 to 15 mμ wide.

It is pointed out that the plaque method is applicable to the determination of bacterial infection of cereal seed. Species-specific phages may be used to detect their specific organisms in environments from which they are unable to be isolated by conventional plating methods.

WALTERS (H. J.). **Effect of seed treatment on Bean root rot.**—*Plant Dis. Reptr*, 38, 12, pp. 856–857, 1954. [Multilithed.]

Various seed treatments, in experiments from 1950 to 1953 inclusive, at Wyoming Agricultural Experiment Station, Laramie, failed to control bean [*Phaseolus vulgaris*] root rots, caused mainly by species of *Fusarium*, which present a serious problem to growers, and gave no significant increase in yield. Severity of root rot was not correlated with yield.

MEDERSKI (H. J.) & VOLK (G. W.). **Manganese deficiency may reduce yield of Soybeans.**—*Fm Home Res.*, 39, 287, pp. 28–29, 1 fig., 1954.

Manganese deficiency in soy-beans is reported from the western half of Ohio. The symptoms and the control have already been described from another source [*R.A.M.*, 27, p. 507].

ZINK (F. W.) & GROGAN (R. G.). **The interrelated effects of big vein and market price on the yield of head Lettuce.**—*Plant Dis. Reptr*, 38, 12, pp. 844–846, 1954. [Multilithed.]

Data obtained from ten commercial lettuce fields in the Salinas Valley, California,

are presented in support of the view that lettuce big vein virus [*R.A.M.*, 32, p. 359] affects the yield of marketable lettuce without necessarily causing economic losses. Instances have been reported of almost 100 per cent. infection in fields from which the profits occasionally surpassed those obtained from predominantly healthy fields harvested at other times. This appears to be directly related to the market conditions at harvest. When demand is great the poorer quality lettuce is accepted, but it is refused if sufficient supply of good quality lettuce is available.

COUCH (H. B.). **Studies on seed transmission of Lettuce mosaic virus.**—*Phytopathology*, 45, 2, pp. 63–70, 2 figs., 1955.

At the Department of Plant Pathology, University of California, Davis, the percentage of seed transmission of lettuce mosaic virus [*R.A.M.*, 32, p. 533] in individual plants of the Bibb variety ranged from 0·21 to 14·18 and averaged 7·88 per cent. The rate of transmission was distributed at random among the various floral heads, irrespective of topographical relationships or time and order of floral initiation. Plants inoculated just before flowering produced fewer infected seeds than when the operation was performed soon after planting. Plants that contracted mosaic after the inception of flowering did not transmit the virus through the seed.

The absence of seed transmission of lettuce mosaic virus in the Cheshunt Early Giant variety reported by Kassanis [27, p. 214] and Broadbent [31, p. 5] was confirmed. The earliest formed floral heads of infected plants were killed, but recovery ensued and normal seed was produced. Juice from recovered shoots induced only half as many local lesions on *Gomphrena globosa* [34, pp. 273, 507] as did that from the vegetative tissue of younger diseased plants. In Cheshunt Early Giant the procambial and epidermal tissues of the peduncle were particularly sensitive to the virus. Total obliteration of the procambial tissue was characteristic, while the vessels and laticiferous elements were filled with a gummous exudate. The eventual blighting of the entire floral shoot may account for the absence of seed transmission in this variety.

FRIEDMAN (B. A.). **Brown spot complex of head Lettuce on eastern markets.**—*Plant Dis. Reptr.*, 38, 12, pp. 847–851, 1 fig., 1954. [Multilithed.]

Lettuce samples from various regions of the United States were examined in 1953 at the Biological Sciences Branch, Agricultural Marketing Service, United States Department of Agriculture, New York, for brown spot, the name proposed for various disorders of undetermined cause occurring in the market, in transit, or in storage. At least three types were distinguished. The most common, a midrib and vein discoloration of field origin frequently encountered in the New York market in samples from California, Arizona, Texas, Florida, Georgia, South Carolina, and Virginia, is characterized at first by a light colour of the midrib of the outer leaves, particularly the upper surface; later the discoloration darkens to blackish brown and extends to the smaller veins and interveinal areas and to the inner leaves. It resembles a number of disorders, including russet (*Phytopathology*, 9, pp. 497–520, 1919), vein browning (*Rep. Ky agric. Exp. Sta.* 32, Part 1, pp. 45–46, 1919), rust [*R.A.M.*, 2, p. 528], a tipburn-like condition [12, p. 270], and brown blight [24, p. 2].

In post-harvest breakdown a pronounced brown spotting develops on the interveinal tissue of the inner head leaves, possibly due to delay in transit or inadequate refrigeration *en route*, or adverse growing or harvesting conditions. A similar condition, referred to as storage breakdown, was observed in New York in western-grown lettuce stored in a sound condition for two to four weeks at 32° to 38° F.

A type of internal breakdown, also superficially similar, the leaves becoming water-soaked and brownish grey but not spotted, was noticed on lettuce packed in non-perforated pliofilm bags in which the oxygen content of the air was only 3·5 per cent.

The third type of brown spot, occurring on the inner leaves and associated with bacterial soft rot of the outer leaves, is probably similar to redheart described by R. Nelson [6, p. 765]. The discoloration starts in the epidermal cells on either surface and spreads to the mesophyll tissue, whereas in the other two types the mesophyll cells are affected first. In the later stages of all three types of brown spot numerous bacteria are present in the lesions, but inoculation experiments have failed to reproduce the symptoms.

The brown spot complex and tipburn, though similar in many respects, are regarded as two distinct disorders developing in response to different environmental conditions.

Smith (W. L.). **Streptomycin sulfate for the reduction of bacterial soft rot of packaged Spinach.**—*Phytopathology*, 45, 2, pp. 88–90, 1955.

Preliminary *in vitro* tests at the Agricultural Marketing Service, U.S. Department of Agriculture, Beltsville, Maryland, having demonstrated the extreme sensitivity of *Erwinia carotovora* and *E. atroseptica* to dilute concentrations of streptomycin sulphate, experiments were performed to determine the efficiency of the antibiotic in the control of bacterial rot of spinach packaged in plastic bags [cf. *R.A.M.*, 31, p. 4]. Used as a spray one or five days before harvest or as a momentary, a five-, or a ten-minute post-harvest dip, an aqueous solution of 1,000 p.p.m. streptomycin in 0·5 per cent. tween-20 reduced the incidence of decay after two days at 70° F. to a minimum (nil with the momentary post-harvest dip). After three days the amount of rot in the treated bags was less than or equal to that in the controls after two days. At the end of three days the leaves in the untreated bags were entirely decomposed.

Pontis Videla (R. E.) & Rodríguez Landaeta (A.). **Una podredumbre de los frutos de la Berenjena (Solanum melongena L.) en Venezuela causada por Phytophthora capsici Leonian.** [Fruit rot of Eggplant (*Solanum melongena* L.) in Venezuela caused by *Phytophthora capsici* Leonian.]—*Agron. trop., Maracay*, 3, 2, pp. 117–119, 1 fig., 1953. [Received 1954.]

Eggplants at the Phytotechnology Division of the National Institute for Agriculture, Maracay, Venezuela, developed a rot causing almost total loss just as the fruits were nearing maturity. The disease was characterized by small, irregular, damp patches on the fruits, eventually turning dark chestnut in colour and occasionally covered by a whitish powder. The fruits finally rotted completely. They yielded cultures of *Phytophthora capsici* [*R.A.M.*, 30, p. 433; C.M.I. map No. 277], which was reisolated after inoculation to healthy fruits. This is the first record of the disease attacking eggplants in Venezuela and apparently the first time it has occurred on this host in epiphytotic proportions.

Chorin (M.) & Minz (G.). **Leaf spots of Peanuts.**—*Hassadeh*, 34, 7, pp. 471–473, 1 fig., 1954. [Hebrew.]

Leaf spot of groundnuts in Israel appears to be caused by only *Cercospora personata* at present. A description of the disease and the fungus, its development and spread, injury and losses, and cultural and chemical methods of control are given in detail. From the results of a preliminary experiment sulphur dusting proved promising.

Catherinet (M.), Sauger (L.), & Tardieu (M.). **Perspectives nouvelles pour la lutte contre la rosette de l'Arachide.** [New prospects for the control of rosette of Groundnuts.]—*Bull. Cent. Rech. agron., Bambey* 12, pp. 79–88, 1 graph, 1954. [English summary. Mimeographed.]

In 1952, the yields of 11 groundnut lines found resistant to the very severe

chlorotic form of rosette virus were compared at the Centre for Agricultural Research, Bambey, Senegal [*R.A.M.*, 33, p. 464] with those of 15 susceptible varieties. The former were 40 per cent. higher, and as the susceptible varieties, under normal conditions, yield an average of 20 per cent. above the resistant, the reduction may be attributed to the disease. This was particularly severe in 1952, nearly all the plants being infected. Other experiments showed a reduction of 30 per cent. The chlorotic form of the disease has an incubation period of 15 to 20 days and then progresses rapidly for the next 10 to 15 days.

The resistant lines cannot yet be released as their yield is still insufficient. They should be used for the time being only in areas where the ravages of the virus are constant enough to prohibit the cultivation of susceptible varieties. Reciprocal crossings were carried out between the resistant and high-yielding susceptible varieties.

MIDDLEBROOK (S.). **The tray system condemned as operated in Britain.**—*M.G.A. Bull., 1953*, 43, pp. 227–231, 1 fig., 2 diags., 1953.

The author criticizes the tray system of mushroom cultivation [*R.A.M.*, 29, p. 399] and advocates the use of properly managed shelves, which he regards as more convenient and more economical.

MORRIS (L. G.). **How to steam sterilise your casing soil.**—*M.G.A. Bull., 1953*, 45, pp. 289–291, 1 fig., 1953.

Various methods of steam-sterilizing the casing soil for improved mushroom cultivation are discussed. The use of trolleys, in which the soil can be steamed, for transporting the soil to the boiler is strongly recommended, particularly the type produced experimentally by the National Institute of Agricultural Engineering, holding 4 cwt. soil. In this, $\frac{3}{4}$ ton soil can be steamed in an hour at a consumption of about 150 lb. steam.

WOOD (F. C.). **Stroma.**—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), 4, 5, pp. 83–85, 3 figs., 1953.

A definition is given of the term 'stroma' commonly used by mushroom growers to imply any abnormal spawn growth in the casing soil. In the most usual type of stroma, known as 'overlay', the spawn grows vigorously, forming in its initial stages a fine, fluffy growth, caused by an excess of moisture. This condition is corrected by raking the soil to improve air circulation and watering with a pressure hose to break up the stroma. Covering the stroma with neat hydrated lime or heavily limed casing soil ($\frac{1}{8}$ in. deep) helps mushroom formation in some cases. Deep stroma, consisting of very heavy thread formation in the lower layers of the casing soil, is treated by scattering a layer of furnace ash ($\frac{1}{4}$ in. deep) and superphosphate (2 oz. per sq. yd.) over the surface, cutting the casing soil with an old knife to break the matted threads, and watering in the usual way.

GANDY (Miss D. G.). **Copper sulphate as a selective fungicide in compost.**—*M.G.A. Bull., 1953*, 43, pp. 225–226, 1953.

In tests in the laboratory and on commercial mushroom farms copper sulphate sprayed or watered on the compost at $\frac{1}{2}$ to 1 lb. per ton at the last turn or just prior to filling has sometimes given good control of truffle disease [*Pseudobalsamia microspora*: *R.A.M.*, 32, p. 467; 34, p. 205], though results have been variable. It may also be effective against verdigris or mat [associated with *Myceliophthora sulphurea* and *M. lutea*: loc. cit.].

MCKEEN (C. D.). **Observations on the occurrence and control of powdery mildew on greenhouse Cucumbers in Ontario.**—*Plant Dis. Reptr.* 38, 12, pp. 860–863, 1954. [Multilithed.]

In tests at the Science Service Laboratory, Harrow, Ontario, for the control of

cucumber powdery mildew (*Erysiphe cichoracearum*) under glass, karathane (isocthan) [cf. *R.A.M.*, 33, p. 280], 5 to 8 oz. in 100 gals. spray, was superior to sulphur and copper sulphate and when applied as a smoke gave outstanding control, three treatments at six-day intervals eradicating the fungus on heavily infected plants. Foliage injury was much slighter from smoke than from spray applications.

Amen (C. R.) & Porter (C. A.). **The spread of Cucumber mosaic virus in Cucumber plantings during harvesting.**—*Plant Dis. Reptr*, 38, 12, pp. 841–843, 1954. [Multilithed.]

Field studies at Corvallis, Oregon, demonstrated the importance of harvesting in the spread of cucumber mosaic virus in cucumber plantings [*R.A.M.*, 34, p. 10], if the virus is present initially. In 1951 the average percentage infection in plots containing a few inoculated plants and picked 12 times was 36·9, compared with 14·8 in those inoculated but not picked, the corresponding figures for 1952 being 78·8 and 32·4.

Whitaker (T. W.) & Bohn (G. W.). **Mosaic reaction and geographic origin of accessions of Cucumis melo L.**—*Plant Dis. Reptr*, 38, 12, pp. 838–840, 1954. [Multilithed.]

Of the 700 accessions of *Cucumis melo* exposed to 100 per cent. natural infection by the cantaloupe mosaic virus complex [*R.A.M.*, 29, p. 245; 31, p. 368] in the Imperial Valley, California, during 1948–52, 23 possessed sufficient tolerance or resistance to be considered useful for breeding. Of these 18 were *C. m.* var. *conomon* or *conomon*-like types. The best sources of tolerant or resistant plants were China and Korea, followed by northern India and Pakistan.

Payen (B.), Thellot (B.), & Thiollière (J.). **Mise en évidence d'une synergie entre le zinèbe et les produits cupriques dans la lutte contre le mildiou de la vigne.** [Demonstration of synergy between zineb and copper products in the control of the mildew of Vine.]—*C. R. Acad. Agric. Fr.*, 40, 8, pp. 317–320, 1954.

In laboratory studies micronized tetracupric oxychloride (50 per cent. copper) and 60 per cent. zineb combined in the proportion of 3:1 gave a better kill of *Plasmopara viticola* spores [*R.A.M.*, 34, p. 128] than the two constituents separately. In field tests in 1953 on two-year-old Gamay Beaujolais plants eight applications at 0·3 per cent. reduced defoliation by downy mildew from 100 per cent. on unsprayed plants to nil, compared with 10 per cent. defoliation for 2 per cent. Bordeaux and 1 per cent. tetracupric chloride and 80 per cent. for zineb. The mixture has since been used in vineyards with good effect. In the ensuing discussion it was pointed out that organic fungicides, however effective against the mildew, left traces which rendered the wines produced unsuitable for storage.

Williams (C. F.). **Breeding perfect-flowered Muscadine Grapes.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 274–278, 4 graphs, 1954.

In the course of breeding studies at the North Carolina Agricultural Experiment Station, initiated in 1946 to secure perfect-flowered muscadine grapes, selfed seedlings from Tarheel displayed the greatest resistance to black rot [*Guignardia bidwellii*: *R.A.M.*, 31, p. 275], Burgan seedlings were intermediate, while Wallace and Willard were most susceptible. Seedlings derived from either of these varieties showed similar reactions to the parent in relation to black rot.

Terrier (C.) & Staehelin (M.). **La brunissure de la Vigne.** ['Brunissure' of the Vine.]—*Rev. rom. Agric.*, 9, 11, pp. 88–90, 1953.

Towards the end of August, 1953, vineyards in all parts of French-speaking Switzerland except Valais developed an abnormal bronzing of the upper leaf surface.

No parasitic organism could be detected in affected material, and the condition, which appeared to be identical with 'brunissure' [*R.A.M.*, 14, p. 214; 27, p. 216], is attributed to prolonged high temperatures coinciding with periods of excessive sunshine.

MARAMOROSCH (K.). **Do developmental stages occur in the reproductive cycle of Aster-yellows virus?**—*Cold Spr. Harb. Symp. quant. Biol.*, 18, pp. 51–54, 1 fig., 1953.

After a brief review of the literature concerning the reproductive cycle of aster yellows virus [*R.A.M.*, 33, p. 336] the author states that even by the most sensitive assay methods the virus cannot be detected in the leafhopper vector until four days after inoculation. In comparison with animal viruses the aster yellows virus might be supposed to multiply in the plant and the insect during the four-day period when they both appear to be non-infective. The present state of knowledge is not sufficient to decide whether this period of inactivity is due to a change in infectivity of the virus particles or to a very low concentration during the early stages of incubation.

KOZŁOWSKA (A[NIELA]). **Z biologii wirusów roślinnych.** [On the biology of plant viruses.]—*Acta microbiol. polonica*, 2, 4, pp. 319–331, 2 graphs, 1953.

Studies at Cracow and Zakopane, Poland, from 1947 to 1952, on the correlation between climate and the spread, intensity, and external symptoms of potato viruses X and Y [*R.A.M.*, 33, pp. 441, 442] have shown that the biological state of the plant is more important in determining potato infection with virus Y than the virus itself. The epidemic character of the disease is due to drought, which in previous years caused degeneration of the plant. Potato virus X increased in plants transplanted from Pomerania to Cracow, indicating that the infection intensity changes with different environmental conditions. Similarly, strains of virus X become modified in accordance with the potato variety and climatic conditions involved. Thus, mildly virulent strains of the virus become strongly virulent and vice versa. Under the climatic conditions of the mountains virus Y symptoms become masked and infection reduced, while strongly virulent strains of virus X do not develop.

Plant quarantine import restrictions.—*S.R.A., Bur. Ent., Wash.* (*1952*), 181, pp. 48–82, 1954.

Particulars are given of the basic, revised, or supplementary plant quarantine import restrictions prevailing in Austria, Belgium, Bermuda, Canada, Cape Verde Islands, Costa Rica, Cyprus, France, Guatemala, Honduras, India, Jamaica, Italy, Mauritius, New Zealand, Nicaragua, Rumania, Trinidad and Tobago, and Venezuela.

Plant pathology division.—*Res. & exp. Rec. Minist. Agric. Nth. Ireland, 1952*, pp. 87–91, 1954.

An examination of 220 samples of oats from the 1950 seed crop in Northern Ireland revealed that 1·8 per cent. of the seeds were infected by *Helminthosporium* [*Pyrenophora*] *avenae* [*R.A.M.*, 31, p. 593] and 13·9 by *Fusarium* spp. [loc. cit.]; at least 20 per cent. of the samples were contaminated with *Ustilago* spp. Only 23 per cent. of the samples had been grown from seed treated with an organomercurial. Many oat crops suffered damage from *Gibberella zeae* in 1951 [32, p. 309], while *Ophiobolus graminis* [32, p. 422] attacked isolated plants.

Experiments comparing the efficacy of various chemicals for the destruction of potato haulms [cf. 32, p. 395] showed that the most satisfactory was sodium chlorate although 30 lb. per acre was necessary. The addition of copper sulphate or sodium chloride reduced the cost of sodium chlorate application.

Tubers of the potato varieties Ulster Ensign, Arran Pilot, and Arran Banner,

tested for virus diseases by grafting and sap inoculation, were found to be virus-free, while some of those of Arran Victory, Arran Peak, and Gladstone and all of Stormont Dawn carried potato virus X [31, p. 593]. It has been found possible to propagate stocks free from virus X by growing in isolation.

GOIDÀNICH (G.). **Unusual incidence of diseases affecting economic plants in northern Italy.**—*F.A.O. Pl. Prot. Bull.*, 3, 1, pp. 4–7, 2 figs., 1954.

Since 1949 an extensive survey of plant diseases has been carried out in the Romagna (Emilia) region and other parts of northern Italy by the Institute of Plant Pathology of the University of Bologna and the joint Experimental Laboratory of the Ministry of Agriculture and Forestry. During the survey large numbers of sclerotia of *Claviceps purpurea* were found in threshed wheat in the Po valley [cf. *R.A.M.*, 27, p. 67; 32, p. 258]. The centre of infection appeared to lie in an area between the Provinces of Modena and Reggio Emilia, south of the Po, where wild grasses were also heavily infected. Ergot usually appears in Italy only at high altitudes, and infection is confined almost exclusively to rye. The occurrence of the disease in the Po valley is attributed to exceptionally humid conditions at flowering.

A new type of beet virus yellows [33, p. 331], 'Romagna yellows', recently found in Romagna, appears to be more virulent than ordinary virus yellows. In the early stages of the disease the secondary veins of leaves at the centre of the plant turn yellow; significant anatomical changes, including hypoplasia of the fibro-vascular elements and the surrounding parenchyma, are also present in affected plants.

During the past few years, the leaf blotch of horse chestnut (*Aesculus hippocastanum*) caused by *Guignardia aesculi* [cf. 28, p. 38] has steadily increased throughout Italy. Individual trees near those heavily defoliated remained apparently healthy.

A number of *Acer negundo* trees have for some years displayed an intense mottling of the foliage. Minute to star-shaped chlorotic areas, which frequently become confluent and form irregular spots several mm. in diameter, are scattered over the whole leaf, and in advanced stages of the condition the affected leaves become crinkled and 'depressed'. In some respects the disease appears to resemble that described by Atanasoff from Bulgaria [14, p. 462; see also 30, p. 14]; it is probably of virus origin.

30. Pflanzenschutz Tagung der Biologischen Bundesanstalt für Land- und Forstwirtschaft in Bad Neuenahr, 11.–16. Oktober 1954. [Thirtieth Plant Protection Conference of the Federal Biological Institute for Agriculture and Forestry at Bad Neuenahr, 11th to 16th October, 1954.]—*Mitt. biol. ZentAnst. Berl.* 83, 174 pp., 9 figs., 8 graphs, 1 map, 1955.

Most of the papers presented at the above-mentioned conference [cf. *R.A.M.*, 34, p. 77] were concerned with entomological and helminthological subjects. W. MÄSSING (pp. 59–68) contributes a study on captan within the framework of other fungicides, discussing its potentialities and limitations. So far the principal uses of this mild, reliable chemical in Germany have been in the vineyard, the orchard, and the kitchen-garden. It is available only as a dust containing 50 per cent. of the active principle under the name of orthocide 50.

E. L. LOEWEL (pp. 69–73) reports on the performance of captan in the control of apple scab (*Venturia inaequalis*) during the past two seasons in the Lower Elbe Valley, where experiments were carried out under the supervision of the Pomology Research Institute, Jork, near Hamburg [loc. cit.]. The compound proved superior to any of the fungicides hitherto tested and is to be recommended for use on susceptible varieties like Signe Tillisch in regions where the disease is rife; an attempt should be made, however, to reduce the high cost of DM. 8 per tree.

Captan should be applied at a minimum concentration of 0·3 per cent., which in 1954 resulted in 83·7 per cent. scab-free fruits on Signe Tillisch and 94·2 per cent. on Gravensteiner, the corresponding figures for the 0·25 per cent. strength being 69·2 and 86·9 per cent., respectively. No trace of phytotoxicity was observed in tests on over 100 varieties and hybrids; on the contrary, the colour and lustre of the fruits were favourably influenced by the treatment. Only three varieties developed foliar injury. Captan was not effective against pear scab (*V. pirina*) and compares unfavourably with wettable sulphur in its failure to control apple mildew [*Podosphaera leucotricha*]. It was found to be harmless to bees, and may therefore be applied while the trees are in flower, but for the moment its principal use is as a pre-blossom spray and again in the late summer as a preventive of storage scab.

From the Institute for Phytopathology of the Karl-Marx-University, Leipzig, E. Mühle (pp. 74–75) describes the successful treatment of peppermint stolons against rust (*Puccinia menthae*) [C.M.I. map No. 211; *R.A.M.*, 32, p. 201] by immersion in a solution of rhodanedinitrobenzol (Farbenfabrik Wolf) for a total of 72 hours, divided into 12-hour periods of alternate soaking and drying. The teleutospores were entirely destroyed, and the few isolated pustules developing on the plants grown from treated material are attributed primarily to secondary infection from neighbouring fields.

A useful summary of the available information on the phytopathological significance of the trace elements is contributed by E. Brandenburg (pp. 159–168), including observations at the Justus-Liebig-College, Giessen, on a number of mineral deficiencies, including potassium and magnesium in apple [cf. 29, p. 624], manganese in oats [cf. 33, p. 103] and beet [cf. 33, p. 132], boron in beet [33, p. 400], swedes [cf. 27, p. 337; 29, p. 249], cauliflower [33, p. 697], celery [cf. 34, p. 73], lucerne [cf. 33, p. 235], and apple [cf. 33, p. 364], and molybdenum in cauliflower [34, p. 11], which is particularly severe on Fricke's Ideal, Delfter Markt, and other varieties of the Alpha group.

K. Fritsche (pp. 169–170) has investigated the problem of latent copper deficiency in cereals [32, p. 122] and beet [16, p. 362] at the Hanover Plant Protection Bureau. In 163 tests in grain fields in northern Lower Saxony in 1950–1 and 1951–2 the average yield increase derived from soil amendments of 50 kg. copper sulphate per ha. was 1·4 doppelzentner [1 dz. = 100 kg.]. In subsequent experiments in 142 of the same fields increased yields of cereals and beet were obtained by the admixture of copper with the dynamal seed dressing [33, p. 517].

From the Institute for Viticulture, Bernkastel-Kues, W. Gärtel (pp. 171–175) reports an estimated financial loss of about DM. 2,500,000 in the Moselle and Nahe Valleys alone due to the reduction in the 1954 grape harvest by boron deficiency [33, p. 589], which was aggravated by abnormal weather conditions, especially the spring and summer drought. Schmucker's studies have demonstrated that in many varieties boron is indispensable for pollen germination. Fertile pollen tubes measuring 1·7 to 2 mm. and upwards develop in 5 to 10 per cent. sugar solutions only with the addition of 0·3 to 10 mg. per cent. boron. The stigma secretion of healthy vines contains 0·15 to 0·3 mg. per cent. boron, which is undetectable in those suffering from a deficiency of the element. Almost everywhere in the region under observation the boron content of the soils is on the threshold of insufficiency and calls for amendments of borax at a dosage of up to 200 kg. per ha.

Plantesygdomme i Danmark 1952. Årsoversigt samlet ved Statens plantepatologiske Forsøg, Lyngby. [Plant diseases in Denmark 1952. Annual report compiled by the State Phytopathological Experiment Station, Lyngby.] *Tidsskr. Planteavl*, 58, 5, pp. 806–870, 1 fig., 2 graphs, 1955. [English summary, pp. 856–870.]

Some of the information in the current report [cf. *R.A.M.*, 34, p. 346], contributed

by O. Wagn, M. H. Dahl, H. R. Kristensen, and H. A. Jørgensen, has already been noticed from other sources in this *Review*. *Ophiobolus graminis* was prevalent throughout the country and caused severe damage, the first infected samples of wheat and barley having been received in mid-June. Barley seems to have sustained particularly severe injury, while rye was the chief host among winter cereals. The disease is attributed in the first place to an unsuitable scheme of crop rotation with unduly frequent cultivation of cereals, but nutrient deficiency and wrong treatment of contaminated stubble are contributory causes. *Rhizopus nigricans* [*R. stolonifer*] appeared as a virulent parasite of barley seed germinating in damp, ill-ventilated incubators, and intended as a vitamin food for cows; the fungus rendered it quite unfit for the purpose.

Beet yellows virus [34, p. 200] was widespread from mid-July onwards, and during the next two months heavy infestation by peach and black bean aphids [*Myzus persicae* and *Aphis fabae*] resulted in its rapid dissemination. The incidence of infection commonly ranged from 40 to 90 per cent. and reached 75 to 100 per cent. in a few districts.

Potato leaf roll virus assumed a highly virulent form, especially on the Alpha variety. The percentages of infection in crops from uncertified and certified seed ranged from 50 to 75 and 3 to 10, respectively. The presence of *Synchytrium endobioticum* was notified from nine new municipalities.

Didymella applanata [C.M.I. map No. 72] was very prevalent and caused serious damage on raspberries in August and September. In some areas *Sphaerotheca mors-uvae* was effectively combated on gooseberries by spraying with 8 per cent. lime-sulphur or 6 per cent. copper sulphate, whereas in others these treatments were ineffective. Unknown factors are evidently involved in the development of the mildew. A reduction in the incidence of *Peronospora destructor* on shallots is attributed to the influence of 24 to 36 hours' exposure of the setts to a temperature of 40° C., which destroys the fungus.

Damp weather favoured the development of *Phytophthora infestans* and a concurrent cold spell weakened tomato plants, culminating in destructive outbreaks of blight.

Mycogone perniciosa was found parasitizing brown mushrooms, hitherto believed to be immune from this pathogen [*R.A.M.*, 25, p. 58].

A number of new viroses were reported. A malformation of apple fruits, especially of the Gravenstein and Guldborg varieties, closely resembling that associated with false sting [22, p. 438] and green crinkle [31, p. 612], was observed in several places. Grafting experiments are in progress.

Investigations have shown that tomato aspermy virus is identical with chrysanthemum mosaic virus [32, p. 483]. It is transmissible to *Nicotiana glutinosa*, *N. rustica*, White Burley tobacco, petunia, zinnia, *Tetragonia expansa*, and *Gomphrena globosa*. By means of the test plants *Dianthus barbatus*, *T. expansa*, and *G. globosa* the existence of a virus presenting many analogies with the carnation mosaic virus was demonstrated in several carnation varieties. The chlorotic local lesions on the leaves were very much like those induced by the carnation virus reported from England and Holland. Flamboyante and Korneforus tulips harboured a virus of the tobacco necrosis type which is reported to be responsible for the 'Augusta disease' in Holland [29, p. 215]. The foliage was covered with necrotic spots and streaks, and dead areas also occurred on the stems and flowers. Mechanical inoculation of the virus to bean (*Phaseolus vulgaris*), *T. expansa*, and *G. globosa* induced characteristic local lesions.

Inoculated with a virus from a single bean plant with severe veinal necrosis, *T. expansa* reacted by typical tobacco necrosis symptoms, indicating the identity of the bean disease with 'stipple streak', reported from Holland [32, p. 229] and England. Another host of the virus is *Primula obconica* [29, p. 511].

At the end of May, Marie Legray lilac leaves developed conspicuous, citron-yellow streaks and circular spots, unevenly distributed over the surfaces and sometimes coalescent. Other features of the disease, which closely resembles viroses of the same host reported from the United States, Czechoslovakia, Bulgaria, Yugoslavia, [and the U.S.S.R.: 32, p. 434], were yellow bands along the veins and an oak-leaf line pattern. Mosaic virus symptoms were severe on sweet pea [30, p. 417]. The disease is probably of long standing in Denmark. A fairly widespread mosaic disease of the Pink Pearl hyacinth variety [cf. 11, p. 624] is under investigation. Pale, chlorotic spots and stripes are formed on the leaves, which in severe cases are crumpled, twisted, and drooping, while the flowers are fewer and much smaller than those of normal plants. Several viruses may be implicated in the etiology of a ring spot of gladiolus which awaits closer investigation, e.g., *Cucumis* virus 1 [cucumber mosaic virus], *Phaseolus* virus 2 [bean yellow mosaic virus], and *Nicotiana* virus 12 [tobacco ring spot virus: 31, p. 385 *et passim*].

The virus responsible for broad bean mosaic [cf. 34, p. 80] was transmitted mechanically to its own host, clover, pea, and sweet pea.

Podosphaera oxyacanthae [26, p. 550] was observed on quince, apparently a new host for Denmark. Another new record is *Ramularia deusta* on sweet pea [30, p. 417].

Wallace (G. B.) & Wallace (Maud M.). **Tanganyika fungus list : recent records Nos. XVI, XVII, and XVIII.**— *Mycol. Circ. Dep. Agric. Tanganyika* 33, 6 pp.; 34, 8 pp., 1953; 36, 7 pp., 1954.

The new host and fungus records for Tanganyika mentioned in the first of these circulars [cf. *R.A.M.*, 31, p. 225] and most of those in the second have already been noticed from other sources [34, p. 351]. The imperfect state of the rice foot rot organism (*Gibberella fujikuroi*) was observed for the first time on plants in the Rufiji area. A virus disease of tree tomato [*Cyphomandra betacea*] is considered by K. M. Smith to be new to science and is called Mbeya mottle virus. A hitherto unrecorded disease of papaw caused by a fungus declared a new species, *Sphaceloma papayae*, by A. Bitancourt and A. Jenkins, was found in a plantation near Moshi.

The third includes the following items. *Fusarium oxysporum* f. *vasinfectum* [*F. vasinfectum*], not previously recorded in the Territory, occurred in cotton at Geita and Lubaga in Lake Province. Maize rust (*Puccinia polysora*) [loc. cit.] was found in 1954 at Kisarawe, Bagamoyo, Moshi, and Arusha, again being more common at low altitudes particularly along the coast. Strain H (international strain 2) of *Phytophthora infestans* was identified in the potato variety 1792a (3) from Lushoto: this variety was immune from the strains previously known to be present [33, p. 250]. Strain I (3, 4) was identified by Dr. Black from tomato sent from Lyamungu in November, 1953. It is new to East Africa. Ratoon stunting virus [33, p. 382] was diagnosed in sugar-cane from two different localities. Other new records were *Corynespora cassiicola* on *Salvia leucantha* and *Pyrenophora tritici-repentis* on wheat.

Notes on current investigations, research July to September, 1954. *Malay. agric. J.*, 37, 4, pp. 225-232, 1954.

In this report [cf. *R.A.M.*, 33, p. 141] it is stated that a previously unrecorded leaf disease of pak choy [Chinese cabbage: *Brassica napus* var. *chinensis*], a form of anthracnose caused by a species of *Colletotrichum*, occurred in Province Wellesley, Federation of Malaya, during 1954. Imported Japanese varieties were more severely affected than a local one. At the Federal Experiment Station, Kuala Lumpur, the spraying of jute with copper oxychloride reduced incidence of stem canker (*C. capsici*) [33, p. 524] from 55 per cent., severely, and 34 per cent., slightly,

affected plants in the unsprayed plots to 22 and 15 per cent., respectively, in the sprayed.

A hitherto unrecorded disease of durian [*Durio zibethinus*] was investigated at the Federal Experiment Station, Serdang. The bark on the trunk and lower branches rotted, the surface turning dark purple. The condition appeared to be associated with a species of *Nectria* resembling that found locally on cacao [32, p. 367].

The occurrence of *Valsa eugeniae* [cf. 34, p. 63] and *Cryptosporella eugeniae* [cf. 33, p. 411] on clove trees in Penang has been confirmed. The wide prevalence of these diseases locally appears to be favoured by unsatisfactory methods of cultivation and attacks by beetles (*Chelidonium brevicorne* and *Miraeus tricolor*).

VASUDEVA (R. S.). **Recent developments in plant diseases in India.**—*F.A.O. Pl. Prot. Bull.*, 3, 2, pp. 22–23, 1 fig., 1954.

In this account of work at the Division of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi, it is stated that the new race of stem rust (*Puccinia graminis*) [*R.A.M.*, 34, p. 348] collected from Kenphad-28 wheat in Coimbatore and closely allied to race 72 [33, p. 415; 34, p. 28] has been designated provisionally race C. Indications of a new race of *P. triticina* were also obtained [33, p. 710]. A new race of flax rust (*Melampsora lini*) [34, p. 349] is designated I_5. On the differential variety Argentina (C.I. 705–1), which is immune from or highly resistant to the known races, it produces susceptible-type infection, while on Koto, which is immune from all four known races, it produces small pustules of the resistant type.

Since 1949 guavas in the Pushkar Valley of Ajmer Merwara have been seriously affected by a disease [31, p. 54] which causes stunting of the shoots, great reduction of leaf size, and defoliation. The leaves become leathery and occasionally interveinal yellowing and green veinbanding are present. Few, if any, flowers develop on affected shoots, and any fruits borne on such shoots are cracked and dry up. The disease is so serious that growers in the Pushkar area are abandoning the cultivation of guava. Recent experiments with zinc sulphate sprays have, however, given encouraging results.

MILLER (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 2, 12, pp. 179–181; 3, 1, pp. 8–10, 2 figs., 1954.

Of the diseases occurring in irrigated areas in Washington, mint rust (*Puccinia menthae*) [*R.A.M.*, 33, p. 50] was observed for the first time in eastern Washington in July, 1953. The disease was present only in one part of one spearmint (*Mentha spicata*) field watered by an overhead sprinkler; it was not present in the remainder of the field (furrow-irrigated) until October, by which time the disease had spread to the lower leaves over most of the 40-acre field. There has recently been a considerable increase locally in the acreage of spearmint and peppermint (*M. piperita*) [32, p. 644] consequent upon damaging rust outbreaks in other important mint-growing areas on the Pacific Coast. The affected field was said to have been planted with roots obtained from stocks propagated in the Yakima valley for some years. That damage was at first confined to the sprinkled part indicates that the rust may become a problem for growers using overhead irrigation.

Pod rot of beans [*Phaseolus* spp.] caused by *Botrytis* sp. [cf. 31, p. 416] is generally present to some extent in most fields in the irrigated areas, especially on pods touching the ground. Exceptionally severe infection (18 per cent. of the pods) was noted in a field of Small Flat White beans grown under sprinklers in the vicinity of Moses Lake. In many instances very young pods near the tops of the plants were destroyed. The soil was very sandy and probably required frequent irrigation; the

plants had not been hilled, which would have kept more of the pods from contact with the soil.

Root rot (*Fusarium solani* f. *phaseoli*) [29, p. 599; 34, p. 71] has rapidly become of major importance as a disease of dry beans in newly irrigated land. Yield losses, though considerable, are not in proportion to the percentage infection, as the plants produce new roots while the tap-root is being destroyed. High hilling and heavy irrigation are required.

In California squash angular leaf spot (*Pseudomonas lacrymans*) [33, p. 520] occurs near San Francisco throughout the year since overhead sprinkling is used during the dry months. As field diagnosis is based on the symptom pattern, the disease may sometimes be mistaken for the spotting caused by *Xanthomonas cucurbitae* [28, p. 56]; the diseases are difficult to distinguish on cucumbers.

The undetermined strawberry disease recently reported from Arkansas [34, p. 233] showed three types of symptom. A few plants were small and clump-like and bore flowers affected by phyllody. On most of the affected plants, however, the symptoms were like those of yellow-edge virus, but as the Blakemore variety, used in almost all commercial plantings in Arkansas, does not manifest leaf symptoms when affected by the yellow-edge virus the new disease is evidently not caused by this virus. The third set of symptoms, seen in comparatively few fields, involved a sudden wilting and death of the plant, without any evident injury to the roots or crowns.

In July, 1953, the Market Pathology Laboratory, Chicago, received Elberta peaches from a commercial shipment from South Carolina. They were kept for a week at 80° to 90° F. and most became infected with brown rot (*Monilinia* [*Sclerotinia*] *fructicola*), but others developed a different kind of infection caused by a fungus identical with *Diplodina persicae* [33, p. 732]. When zonation was conspicuous the early symptoms of this condition resembled those of anthracnose (*Glomerella* [*cingulata*]), but when it was not, the decay might have been confused with brown rot. As the rot progressed, the lesion became sharply delimited and the darkening epidermal tissue developed a fine wrinkling. Small, black pycnidia were apparent at this stage. Inoculations of market-ripe peaches produced lesions closely resembling the original ones. Progress of the decay was rapid, approximately half a peach becoming affected in six days at 80° to 90°, while internal decay was equally rapid, the infected tissue being soft, moist, and pale brown. Early stages of mummification often became apparent one week after inoculation. As the fungus makes little growth at 55° [loc. cit.], prompt pre-cooling of peaches and shipment under standard refrigeration should effectively control the decay during transit.

In June, 1954, the conidial state of a powdery mildew, apparently *Sphaerotheca pannosa* [cf. 17, p. 589; 33, p. 305], was found on almond fruits at the Washington State College Tree Fruit Experiment Station, but no lesions were present on the leaves even at the final examination in mid-July.

NANCE (NELLIE W.). **Some new and important plant disease occurrences and developments in the United States in 1953.**—*Plant Dis. Reptr. Suppl.* 229, pp. 122–154, 8 maps, 1954. [Multilithed.]

Many of these records, taken mostly from *Phytopathology* and *Plant Dis. Reptr.* of new and important plant diseases in the United States in 1953 [cf. *R.A.M.*, 33, p. 167] have already been noticed in this *Review* [see preceding abstract].

Reduction in maize yields by Stewart's disease (*Bacterium* [*Xanthomonas*] *stewarti*) [34, p. 32] in Illinois amounted to 2·8 per cent., the highest since 1938. Charcoal rot (*Macrophomina phaseoli*) [30, p. 24] was unusually abundant on maize in the dry, hot areas (the southern two-thirds) of Illinois, and smut (*Ustilago maydis*) [33, pp. 217, 440] was unusually prevalent, reducing the yield by 1·7 per cent., the highest loss in the state since 1940 when there was 4 per cent. damage.

The cotton bacterial blight organism *Xanthomonas malvacearum* [34, p. 149] was found to carry over from one season to the next in New Mexico. Infected seedlings were found in 1951, 1952, and 1953, indicating that the bacteria overwinter in the soil under local conditions and infect the following season's crop.

Annual Report of the Agricultural Experiment Stations, Florida, for the year ending June 30, 1953.—354 pp., 39 figs., 3 graphs, [? 1954].

In this report [cf. *R.A.M.*, 33, p. 468] R. W. Earhart and D. D. Morey state that zineb, manzate, 4 per cent. phygon XL, and sulphur, used as dusts or sprays, all reduced foliage damage in oats from crown rust [*Puccinia coronata*: cf. 30, p. 514]. All except sulphur increased forage yields but only zineb and manzate dusts those of the grain. According to F. V. Stevenson and V. E. Green the spring planting of the U[nited] S[tates] D[epartment of] A[griculture] Oat Uniform Rust Nursery developed considerable rust [? *P. coronata*]. The varieties Santa Fe, Trispernia, Landhafer, Bondvic, C.I. Nos. 6745, 6600, 6700, 6701, 6748, 6747, 5924, 5371, and Arlington were resistant [cf. 33, p. 291] and Nos. 6746 and 6588 highly so. A second spring planting with material supplied by Dr. D. B. Morey demonstrated the resistance of Camellia, Bondvic, Red Rust-proof No. 14, and Arlington.

C. W. Anderson claims that squash and citron [watermelon] could be used to distinguish between cucumber mosaic virus and two strains each of watermelon mosaic virus [34, p. 76] and muskmelon mosaic virus [34, p. 77]. Only cucumber mosaic is known to infect non-cucurbitaceous hosts. Attempts at the mechanical transmission of virus to hosts of watermelon or cucumber mosaic were made from 19 apparently diseased non-cucurbitaceous species growing near crops affected by either of these viruses. Cucumber mosaic was isolated from seven species and an unidentified virus from one. *Commelina* spp. appeared to be the most important weed hosts of cucumber mosaic [32, p. 359]. Tobacco mosaic virus is evidently commonly associated with yellow pod disease of [chilli] pepper [cf. 33, p. 469].

P. Decker and C. W. Anderson, continuing their investigations into the reaction of chillis to virus diseases in Florida, found great variation among 500 lots. Natural occurrence and spread were confused by the presence of more than one virus in an infected plant. Some lots were severely damaged by southern blight (*Sclerotium rolfsii*), anthracnose (*Gloeosporium piperatum*), frog-eye (*Cercospora capsici*), and bacterial spot (*Bacterium vesicatorium*) [*Xanthomonas vesicatoria*].

According to J. R. Large, four years' experiments have indicated that with dry spring weather pecan scab [*Cladosporium effusum*] may be controlled by spraying first during the period 15th to 25th May and thereafter at approximately three-week intervals. The percentage scab control on 28th August obtained with various chemicals tested was as follows: regular Bordeaux mixture, 100; split Bordeaux-ziram, 99·7; tag 331 plus 1 qt. summer oil, 99; vancide 51, 98·5; crag 658, 94·6; orthocide 406 [captan], 72; and the unsprayed, 15.

H. N. Miller states that CBP-55 (chlorobromopropene) and MC-2 (methyl bromide) gave satisfactory control of *Pythium* root rot of Chinese evergreen [*Aglaonema modestum*]. In propagation frames losses of woody cuttings of various plants from damping-off, caused by species of *Pythium*, *Phytophthora*, *Rhizoctonia*, and *Fusarium*, was almost entirely prevented by rooting under a continuous mist of water with normal outside light intensity.

H. N. Miller found that manzate gave good control of black spot [*Diplocarpon rosae*: 33, p. 28] and *Cercospora* [*Mycosphaerella rosigena*: 30, p. 163] on roses and P. Decker obtained similar control with vancide 51 of *Rhizoctonia* [30, p. 452] on lupin seedlings in greenhouse tests.

E. N. McCubbin and A. H. Eddins report that out of six potato varieties and 16 U.S.D.A. seedling selections resistant to late blight (*P. infestans*) [33, p. 592] grown in replicated plots, Red Warba and four white-skinned selections gave

significantly higher yields than the standard variety Sebago. A. H. Eddins states that in a plant bed where 50 per cent. of the foliage of non-treated cabbage plants was killed by downy mildew (*Peronospora parasitica*), chloranil (4 lb. wettable to 100 gals.), 12 per cent. chloranil dust, and 5 per cent. stabilized chloranil dust gave good control. Of nine cabbage varieties from various sources and nine selections from Wisconsin Agricultural Experiment Station grown in soil infested with cabbage yellows [*F. conglutinans*: 33, p. 71], the selections 2135–S, 2135–51–P, 2135–52–W, and 2135–52–Z produced heads superior in earliness, uniformity, and solidity to those of the yellows-susceptible standard early variety, Copenhagen Market. In an experiment in which 56 per cent. of the untreated potato foliage was destroyed by *P. infestans* no more than 4 per cent. was killed on plants sprayed seven times at four- to 15-day intervals with vancide-zinc sulphate, nabam-zinc sulphate, copper compound A, captan, phygon XL-N, or LO–738, and there was only a trace of blight in the manzate-treated plots. Soil underlaid with a pan and inducing corky ringspot [spraing: 26, p. 76] was broken up 14 to 18 in. deep in November. The percentages of corky ringspot-affected tubers varied from 21·1 to 82·6; the treatment having no effect on incidence. The progeny of 100 affected seed tubers showed no symptoms when grown in non-infested soil.

J. M. Crall reports that gummy stem blight (*Mycosphaerella citrullina*) [33, p. 72], anthracnose (*Colletotrichum lagenarium*) [33, p. 403; 34, p. 511], and wilt (*Fusarium oxysporum* f. [*F. bulbigenum* var.] *niveum*) were the most important diseases of watermelon. Zineb increased fruit set and yield slightly by controlling downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*). Captan stimulated vegetative vigour and increased yields more than zineb, mainly by increasing fruit-set.

G. Swank reports that of 14 fungicides applied eleven times at weekly intervals for the control of celery early blight (*Cercospora apii*), significant control was secured with manzate (1½ lb. in 100 gals.), nabam (2 qt.) plus ¾ lb. zinc sulphate or plus 1 lb. manganese sulphate, ziram and ferbam (1 lb. each), and 4 lb. tribasic copper sulphate.

J. W. Wilson and G. Swank state that cucumber downy mildew (*P. cubensis*) [33, p. 72] was best controlled by nabam (2 qt. in 100 gals. water) plus ¾ lb. zinc sulphate, or plus 1 lb. manganese sulphate, or the two mixtures alternated, and by 1½ lb. manzate, all applied at three-day intervals, while 6 oz. mildex, 2 lb. captan plus ⅓ pt. orthophos 4, nabam (2 qt. plus 1 lb. manganese sulphate), and 1½ lb. manzate gave good control of powdery mildew (*Erysiphe cichoracearum*) [33, p. 280; 34, p. 572].

R. F. Suit states that cop-o-zinc, Robertson fungicide, copofilm, and Calumet and Hecla's copper oxide Nos. 1 and 2 and C & H No. 15, all at equivalent copper concentrations, gave satisfactory control of citrus melanose [*Diaporthe citri*: 33, p. 72]. F[rancenia] E. Fisher, reporting on diseases of citrus pests, states that during the summer of 1952 *Myiophagus* sp. caused the highest mortality of purple scale [*Lepidosaphes beckii*] in non-sprayed groves at the end of June. Mortality was high in numerous groves in the spring of 1952 and 1953, probably owing to the unusually high rainfall. *Entomophthora* sp. was destructive to purple mites [? *Paratetranychus citri*] throughout the spring of 1953. An apparently different *E.* sp. killed the Texas citrus mite (*Eutetranychus citri*). An unidentified *Hirsutella* sp. caused heavy mortality of the saddleback mite (*Hemitarsonemus* sp.). Rust mites [*Phyllocoptruta oleivora*] died in large numbers during late July and August when *Hirsutella thompsoni* was quite abundant.

E. F. Hopkins, K. W. Loucks, and A. A. McCornack report that oranges given a standard dowicide A-hexamine treatment followed by a rinse, and packed in phenodor (diphenyl) fibreboard cartons suffered hardly any decay (*D. citri* and *Penicillium* [*italicum* and *P. digitatum*]) after being held for three weeks at 70° F.

Those packed in untreated cartons had rather less decay than treated fruit in wirebound boxes and suffered no shrinkage. Dry ammonium bicarbonate packed with the fruit in sealed fibreboard cartons was almost as effective as the standard dowicide A-hexamine treatment, and was superior to it when the compound was moistened. The two treatments combined resulted in more than 90 per cent. control over three weeks. During the 1952–3 season seven commercial packing houses used the dowicide A-hexamine treatment on 141,412 boxes of grapefruit, oranges, tangerines, and Temple oranges, with an average reduction in total decay of samples of oranges of 69 per cent. after two weeks at 70°.

M. Cohen and L. C. Knorr state that tristeza virus [34, pp. 296, 366] has been shown by transmission tests to infect Tahiti and Key limes, limequats, and some citrus seedlings. On the whole, the disease spreads very slowly; in many instances trees have been diseased for 15 to 20 years with no signs of spread to other trees. Of many grapefruit trees examined for stem-pitting only one positive case has been encountered.

W. N. Stoner, continuing his studies on the kenaf (*Hibiscus* [*cannabinus*]) virus [31, p. 489], states that it is mechanically transmissible and non-persistent, probably falling within the genus *Marmor*. It appears to be confined to *Hibiscus* spp. Several common varieties of *H. rosa-sinensis* are susceptible and one, Brilliantissima (Single Scarlet), is a symptomless carrier. The symptoms indicate that the virus may be particularly harmful to rootstock varieties and therefore of significance to nurserymen. No insect vector has been found.

W. N. Stoner and F. V. Stevenson found that zineb applied bi-weekly, alone or alternated with a neutral copper, gave the best control of *Helminthosporium* leaf blight of maize [*H. turcicum*] as compared with weekly applications of two commercial copper compounds. R. A. Conover reports that in a replicated experiment applications of zineb (2 in 100), nabam plus zinc sulphate (2 qt.+0·75 lb.), and nabam plus manganese sulphate (2 qt. + 1 lb.) at five-day intervals gave equal control of *H. turcicum*, but the last-named caused some injury. Nabam plus zinc sulphate applied bi-weekly gave even better control. Of various experimental fungicides tested, LO 738 (ethylene bis thiuram trisulphide) gave outstanding control and high yields at 2 in 100 and was non-injurious to the plants.

In March, 1953, Manalucie, a new tomato variety [cf. 33, p. 566] field-immune from *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*], *Stemphylium* leaf spot [*S. solani*], and *Cladosporium* leaf mould [*C. fulvum*], and moderately resistant to early blight (*Alternaria* [*solani*]) and *Phoma* stem canker [*P.* ? *destructiva*: 31, p. 542], was released to growers and seedsmen.

J. M. Walter states that yellow cuprocide and cop-o-zim were approximately equally effective against tomato bacterial spot (*Xanthomonas vesicatoria*) [27, p. 313]. However, the former is somewhat toxic during dry weather while the latter caused tip-burn and progressive shedding of the older leaves in a test in early autumn. Streptomycin sulphate was highly effective at 1 in 4,000 but needs to be applied repeatedly. R. A. Conover secured excellent control with four sprays of 0·1 per cent. streptomycin sulphate at four-day intervals.

R. R. Kincaid states that of 87 tobacco varieties and selections tested, 858 (T.I. 57 one parent), 864 (White Honduras × Rg, B_3), and 881 (selection from RK 25) were comparable with Rg in resistance to black shank [*Phytophthora parasitica* var. *nicotianae*: 33, p. 591; 34, p. 552] and superior in general performance.

G. D. Ruehle, covering potato diseases in Dade county, states that nabam plus zinc sulphate, zineb, cop-o-zinc plus phygon, ethylene bis thiuram trisulphide, and captan all gave excellent control of late blight (*P. infestans*). Semesan-bel and captan dusts gave almost complete control of bacterial seed-piece decay [? *Erwinia carotovora*: 33, p. 558]. The highest yield of No. 1 tubers was obtained from plots treated with captan dust. Experiments on the control of scab [*Sphace-*

loma perseae: 25, p. 350] on large, bearing Lula avocado trees resulted in the following percentages of scab-free fruit at harvest: cuprocide, 97; Robertson fungicide, 98; captan, 60; tribasic copper sulphate, 70; and chlorinated organic mercury, 4. The percentages of Booth-8 fruits free from *Cercospora* [*purpurea*: 26, p. 147] following various treatments were: brown copper oxide, 96; cuprocide, 98; perenox, 99; and copper-zinc-chromate, 97, a conventional-type and concentrate sprayer giving equal control on young, bearing trees.

Rapport annuel pour l'exercice 1953. [Annual report for the year 1953.]—*Publ. Inst. nat. agron. Congo belge, 1953* (hors sér.), 507 pp., 1 map, 1954.

In the section of this report dealing with phytopathological work in the Belgian Congo [*R.A.M.*, 33, p. 412] it is stated that coffee tracheomycosis [*Gibberella xylarioides*: 34, p. 452] now causes only small losses. Anthracnose leaf spots of coffee cuttings, caused mainly by *Colletotrichum coffeanum* [*Glomerella cingulata*: 26, p. 198], were effectively controlled by an application of 1 per cent. Bordeaux whenever new leaves opened. At Gazi the rubber clone TK12 was highly susceptible to stripe canker (*Phytophthora palmivora*) [25, p. 358]. *Cercospora oryzae* was detected on rice for the first time at Yangambi [C.M.I. map No. 71]. Maize rust (*Puccinia polysora*) [*R.A.M.*, 33, p. 150] is endemic in the vicinity of Yangambi, but as infection always occurs late the loss of yield sustained is very small. To assist in the evaluation of intensity of infection by maize rust a six-grade scale of notation has been established ranging from 00 for almost complete immunity (only a few, almost imperceptible spots present) to 4 for extreme susceptibility (very numerous, large, well-developed uredosori often surrounded by more or less chlorotic areas). Damage caused by *Sclerospora maydis* [26, p. 236] is more serious, especially when the fungus attacks young plants, which it renders sterile. Local maize varieties appear to be more resistant to *Helminthosporium turcicum* than are American varieties [cf. 32, p. 550]. Groundnut rosette [virus: 33, p. 412] was effectively controlled [cf. 34, p. 74] by five preventive treatments with parathion (emulsifiable solution containing 200 gm. of active material used at 200 l. per hect.) beginning ten days after sowing and repeated at intervals of ten days; the applications were made with a Pasteur atomizer. At the Central Laboratory farm, Yangambi, there was a generalized infection by *Ephelis* sp. on the inflorescences of the pasture grasses *Melinis minutiflora* and *Paspalum scrobiculatum*; *Claviceps* sp. was found on spikes of *Brachiaria ruziziensis* [cf. 33, p. 236].

It was found that cotton seedlings can be successfully transplanted to vermiculite if supplied with an adequate nutrient solution. Seedlings with three or four leaves were inoculated with *Fusarium vasinfectum* [33, p. 143] at time of transfer by steeping the roots in a suspension of the fungus. The fungus could be re-isolated 12 to 25 days later from 14 of 16 inoculated plants.

Fomes lignosus [33, p. 413] and *Armillaria mellea* [loc. cit.] were grown successfully in culture in sterilized soil. After ten days the former produced mycelial cordons reaching to the edge and bottom of the container, whereas in non-sterilized soil the cordons developed only occasionally. The rhizomorphs of *A. mellea* in sterilized soil appeared at the sides of the receptacle after 20 days, none forming in the unsterilized. This result confirms the view that both fungi can spread in soil by means of rhizomorphic cordons alone, in the absence of roots or plant debris. Soil fumigation with carbon disulphide caused no increased activity of *Trichoderma viride* against *A. mellea* [cf. 34, p. 366]. Observations on the nutritional requirements of *F. lignosus* and *A. mellea* [33, p. 413] in nature showed that infection of rubber tree stumps by the fungi was more severe in trees felled without ringing than in trees previously ringed. The latter were usually colonized by various forms of *Rhizoctonia bataticola* [*Macrophomina phaseoli*].

Of three treatments, 5 per cent. carbolineum in water gave the best control of

patch canker (*Pythium complectens*) [cf. 30, p. 74] on 8-year-old rubber trees. Curative treatment of stripe canker with 5 per cent. brunolinum in water was satisfactory.

In a spraying test against *H. heveae* [33, p. 412] two applications (at 1 per cent.) of a product containing 15 per cent. dinitrobenzol rhodane and (at 0·5 per cent.) of one containing 50 per cent. copper oxychloride, made at an interval of three weeks to one-year-old rubber resulted, respectively, in 1,460 and 854 lesions per 100 young leaves, as against 2,228 for the control.

At the Hevea Division, Yangambi (pp. 42–43), in a comparative test begun in 1943, the rubber clones Av 152, M 1, Av 163, Tj 16, DB 5, M 4, Tj 1, Av 49, Y 3/46, M 8, Av 185, 284/69, and 24/44 had, respectively, 84, 83, 64, 63, 47, 25, 21, 17, 16, 14, 11, 8, and 7 trees per hect. affected by B.B.B. (brown bast) [33, p. 143], the number of these without root disease being 64, 24, 16, 10, 8, 5, 5, 3, 2, 2, 2, 2, and 1. In general, it seems that bark browning develops as soon as a tree comes under unfavourable conditions. In many instances, nodule formation [31, p. 423] occurred immediately above the place where a root had been cut away to control *Fomes* [*lignosus*], or below a branch broken off by the wind. Locally, brown bast is often a secondary symptom of another disease, such as *F.* [*lignosus*], *Armillaria* [*mellea*] or *Phytophthora* [*palmivora*]. Control of brown bast will be more effective if the spread of the syndrome of diseases represented by B.B.B. is also controlled. Attempts are to be made to eliminate by selection clones and lines susceptible to brown bast properly so called.

Observations on rubber planted in 1947 and grafted *in situ* in 1949 showed that the initially high incidence of root rot (*F.* [*lignosus*]) gradually declined. Six years after planting, 18 per cent. of the trees in the clearings that had not been burnt and 21 per cent. in the burnt had succumbed, while the percentages of dead trees in plantings made (1) in the year of clearing and (2) $3\frac{1}{2}$ and (3) 9 years later were, respectively, 19·2, 14·2, and 9.

Soil samples taken by the Microbiology Laboratory (pp. 141–142) at depths of 0 to 10 cm. from a permanent site in a heterogeneous forest on 27th November, 1951, 5th February, 13th May, 27th June, and 7th October, 1952, and 17th October, 1953, humidity being, respectively, 20·7, 14·5, 17·5, 18·9, 18·7, and 12·2 per cent., gave, respectively, 19·4, 16·3, 23, 33·5, 26, and 20 viable spores of [unspecified] moulds in thousands per gm. of fresh soil, the corresponding figures for bacteria and actinomycetes being 1,646, 504, 1,617, 1,380, 1,464, and 700. The chief variations occurred after dry periods, which reduced the numbers and modified the composition of the microbial associations. On 27th November, 1951, and 5th February, 13th May, 26th June, and 7th November, 1952, the relative frequency of *Penicillium* was, respectively, 27, 81·5, 44·5, 52, and 43; of *Trichoderma*, 15, 1·4, 10, 10·5, and 11; of *Mucor*, 5, 4·3, 4·1, 3, and 2·5; and of *Aspergillus* 12, 0·7, 1, 3·5, and 1·7. The variation in the relative abundance of *Penicillium* and *Trichoderma*, as a function of soil humidity, corresponds to the ecological characteristics, *P.* being favoured by dry conditions and *T.* by wet.

Controlling black-pod in Western Nigeria.—*New Commonw., May 30, 1955*, pp. 537–8, 3 figs., 1955.

During the 1953–4 growing season over 1,000 Nigerian cacao farmers were trained and lent spray pumps with materials (1 per cent. carbide-Bordeaux mixture) for the control of black pod [*Phytophthora palmivora*: *R.A.M.*, 34, p. 353] under a scheme operated by the Co-operative Supply Association. Ten or 12 applications were given starting with 20 gals. per acre and increasing to 50 gals. as more pods appeared. Some records showed a doubling of the cacao crop in sprayed areas and there is a prospect of the treated acreage being increased sixfold, to 6,000 acres, during 1955.

Boynton (D.) & Erickson (A.). **A response of seedling Cacao trees, under nursery conditions, to magnesium and calcium.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 15–20, 1 fig., 1954. [Received June, 1955.]

Cacao seedlings of the United Fruit Company clone 613 growing in a nursery at the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica, developed an interveinal chlorosis of the older leaves after two or three months' normal growth, followed by necrosis of the chlorotic areas. The terminal leaves of affected plants were often healthy, though tip leaves of severely diseased seedlings were chlorotic and the older leaves fell prematurely. In comparison with the trace element content of healthy mature leaves the magnesium and calcium contents of the chlorotic leaves were low, while potassium was high and phosphorus intermediate. The chlorosis and necrosis was prevented and plant growth improved by a soil application before sowing of calcium (lime 2,000 lb. per acre) and magnesium sulphate (500 lb. per acre), which increased the stand from 37·5 to 69·1 per cent. and the average dry weight from 1·92 to 2·66 gm. It is concluded that the disorder was due to magnesium deficiency under conditions of high potassium and low calcium [*R.A.M.*, 32, p. 548] supply. A further experiment showed that the magnesium overcame the necrosis while calcium was most important in fostering maximum growth.

Shukla (T. N.). **Factors affecting variability in cereal rust reactions. II. Variability due to light.**—*Indian Phytopath.*, 7, 1, pp. 43–52, 2 figs., 1954.

In further investigations [cf. *R.A.M.*, 34, p. 28] at the University of Minnesota the reactions of the wheat varieties Lee, Kenya 58, Kenya 117A, Frontana, Marquis, Mida, Newthatch, Mindum, and Stewart to races 15 and 15B of *Puccinia graminis tritici* were examined under varying conditions of light.

An intensity of 100 foot-candles or less during the period of rust development sufficed for extensive mycelial growth, but sporulation was poor and chlorosis and necrosis were absent. Over 2,000 foot-candles induced sporulation; 3,500 foot-candles or higher intensified primary and secondary sporulation, chlorosis, and necrosis. It increased also general leaf tip necrosis on Kenya wheats infected by race 15B. This symptom did not appear in a day of under four hours. A day of eight to 14 hours accelerated sporulation, infection, chlorosis, and necrosis compared with one of four hours. A complete nutrient solution favoured host development but also sporulation; it had no significant effect on basic resistance. On the whole, the effect of light was secondary to that of temperature.

Chavan (V. M.), Patil (J. A.), Chaudhari (B. B.), & Shaikh (Y. N.). **Rust resistant Wheats for Bombay.**—*Indian J. Genet.*, 14, 1, pp. 1–12, 5 pl., 1 graph, 1954.

Following a general review of the breeding of wheats resistant to [black] rust (*Puccinia graminis*) for Bombay State [*R.A.M.*, 32, p. 179; 34, p. 81], the authors discuss the present position since the introduction of exotic resistant varieties as breeding material [loc. cit.; 34, p. 348]. Among the most highly resistant are the Kenphad Yellow-Early selections 28, 32, and 53, Yellow-Mid-late 25, Red-Early 33, 34, 35, and 39, and 179 of Kenya C. 10854 × Niphad-4.

Difficulties encountered in breeding for rust resistance in this area include the presence of a large number of physiologic races of *P. graminis* [34, p. 578], the effects of environmen and plant age on resistance, the cultivation of different species of *Triticum*, and, until the importation of Gaza [32, p. 179], the lack of a resistant *T. durum* variety.

Cass Smith (W. P.). **Cereal smut diseases and their control.**—*J. Dep. Agric. W. Aust.*, Ser. 3, 3, 3, pp. 329–332, 335–338, 6 figs., 1954.

In Western Australia, wheat loose smut (*Ustilago tritici*) is common, but seldom

present to any serious extent. The incidence of flag smut (*Urocystis tritici*) [*R.A.M.*, 33, p. 342] has fallen considerably in the last 20 years; although still present every year, the disease is now found only in trace amounts, largely because of the wide use of resistant varieties and seed treatment with copper dusts. Approximately 20 per cent. of the wheat acreage is still planted, however, to susceptible varieties (mainly Gabo and Gluclub), and seed treatment has sometimes been neglected or inadequately carried out, with serious results. The fungus appears to have remained stable, and the old-established varieties, such as Nabawa, have retained their resistance; other highly resistant varieties are Eureka II, Festival, Koorda, and Warigo.

On oats, *Ustilago avenae* [C.M.I. map No. 238] and *U. kolleri* are both controlled by seed treatments. The most prevalent smut of barley locally is *U. hordei* [cf. *R.A.M.*, 25, p. 553]. Loose smut (*U. nuda*) occurs here and there in trace amounts, but appears to be increasing.

Miržinska (Jelisaveta). **Prikaz prvih selekcija ozime Pšenice Zavoda za poljoprivredna ispitivanja u Kruševcu.** [Results of first selections of winter Wheat at the Institute of Agricultural Researches at Kruševac.]—*Arh. poljopr. Nauk* [*Trans. Inst. Agron. Res.*], 6, 11, pp. 45–74, 3 figs., 3 graphs, 1953. [French summary.]

Of the three hybrid lines of winter wheat developed at the Institute of Agricultural Researches, Kruševac, Yugoslavia, line 4082 (*Triticum vulgare* var. *lutescens*, a cross between var. *ferrugineum* and Manitoba), was found to possess considerable resistance to *Ustilago tritici* [*R.A.M.*, 14, p. 688], the number of infected ears per sq. m. ranging from 0 to 0·9 for the period from 1939 to 1951, and to *Puccinia triticina* [34, pp. 134, 355].

Valdeyron (G.), Petit (A.), & Séguéla (J.). **L'organisation de la lutte contre le charbon interne du Blé par la désinfection des semences basée sur la détection précoce de l'infection.** [The organization of the control of internal smut of Wheat by seed disinfection based on early detection of infection.]—*C. R. Acad. Agric. Fr.*, 39, 14, pp. 666–671, 1953. [Received 1954.]

In considering the control of loose smut (*Ustilago tritici*) in seed of Florence × Aurore wheat in Tunisia [*R.A.M.*, 34, p. 141] the authors state that there are three major requirements, namely, a means of determining the degree of contamination of the seed before sowing in order to eliminate infected seed, a knowledge of the biology of the pathogen to reduce the likelihood of contamination, and a means of obtaining rapidly large quantities of healthy seed. An estimation by early sowings of the degree of infection likely to develop in a crop was shown to be impracticable, whilst estimates based on the examination of seeds in the laboratory were not feasible, except for classifying the samples. A method of estimating the degree of infection to within 1 per cent., based on Poisson's law [the formula for which is given], is described. It is concluded that with a thorough knowledge of the ecology of smut transmission it would be possible to organize seed production so that infection is avoided entirely.

Christensen (C. M.) & Drescher (R. F.). **Grain storage studies. XIV. Changes in moisture content, germination percentage, and moldiness of Wheat samples stored in different portions of bulk Wheat in commercial bins.**—*Cereal Chem.*, 31, 3, pp. 200–216, 1954.

Small bags of wheat (mostly of the hard red spring Marquis variety) with a moisture content of 12 per cent. were buried in known positions in three bins of commercial wheat with an initial moisture content of 13 per cent. [cf. *R.A.M.*, 34,

p. 520 and next abstracts]. Bins 1 and 2, at Richmond, Virginia, were concrete cylinders, 140 by 15 ft., each containing about 15,000 bush. Bin 3, at Minneapolis, measured 90 by 40 ft. and accommodated 45,000 bush. Circumstantial evidence indicated that the moisture content of the grain in some of the samples exceeded 18 to 20 per cent. during part of the storage period. Moulds, including *Aspergillus flavus* [16, p. 665], *A. glaucus*, and *Mucor* sp. [cf. 28, p. 347], increased in all the samples in the two Richmond bins, with resultant loss of viability in most cases. In the Minneapolis bin the changes in moisture content, mould incidence, and viability were relatively slight.

Olafson (J. H.), Christensen (C. M.), & Geddes (W. F.). **Grain storage studies. XV. Influence of moisture content, commercial grade, and maturity on the respiration and chemical deterioration of Corn.**—*Cereal Chem.*, 31, 4, pp. 333–340, 1 graph, 1954.

At moisture-levels of 15·2 and 17 per cent. the mould count of commercial samples of white dent maize increased over a 14-day storage period. *Penicillium* spp. predominated in the original seeds of all grades and in most of the samples after incubation, but 50 to 100 per cent. of the spores found at the end of the trial were identified as those of *Aspergillus flavus* [cf. preceding and next abstracts].

Tuite (J. F.) & Christensen (C. M.). **Grain storage studies. XVI. Influence of storage conditions upon the fungus flora of Barley seed.**—*Cereal Chem.*, 32, 1, pp. 1–11, 2 figs., 1955.

In further studies in this series at the Minnesota Agricultural Experiment Station [cf. preceding and next abstracts], species of *Alternaria*, *Cladosporium*, and *Fusarium* were common and sometimes numerous in immature barley seed, but the *Aspergillus* and *Penicillium* content was insignificant before harvest and it remained static in samples stored for up to 18 months at moisture-levels of 10 to 13 per cent. (wet weight). At 13·8 to 14·2 per cent. *A. restrictus*, a slow-growing member of the *A. glaucus* group, gradually invaded the germs, while at moisture-contents of 15 to 17 per cent. subspecies of the same group, e.g., *A. repens*, *A. amstelodami*, and *A. ruber*, became the dominant and sometimes the sole species present. The results of comparative tests on mould-free and inoculated barley at moisture-levels favouring the growth of *A.* spp. (including *A. glaucus*, *A. candidus*, and *A. flavus*) indicated that seed invasion by these organisms may cause or significantly contribute to a decrease in germination.

Christensen (C. M.). **Grain storage studies. XVIII. Mold invasion of Wheat stored for sixteen months at moisture contents below 15 per cent.**—*Cereal Chem.*, 32, 2, pp. 107–116, 4 figs., 1955.

Aspergillus restrictus [see preceding abstract] invaded seeds of hard red spring Marquis and other hard and soft red winter and white wheat varieties stored in the laboratory at moisture-contents of 13·5 to 15 per cent. for 16 months. It was also isolated from a high percentage of seeds of samples from commercial bins. The germ appeared to be the principal site of invasion, which resulted in a decline of germination and development of the brown coloration characteristic of 'sick' wheat. *A. restrictus* was rather difficult to detect because of its failure to make any appreciable growth on the standard agar media used for mould culture, but it developed fairly well when the seeds harbouring it were plated on malt agar containing 15 to 20 per cent. sodium chloride. In view of these observations the present generally accepted 'critical' moisture-levels for long-term wheat storage (14·5 and 14 for hard red spring and other varieties, respectively) would appear to be too high. *A. repens* and *A. ruber* were prevalent at 14·5 to 15 per cent.

Tandon (R. N.) & Chauman (R. P. S.). **A note on the effect of temperature on the growth of Wheat mould caused by Aspergillus flavus and Aspergillus tamarii.**—*Sci. & Cult.*, 20, 10, pp. 503–504, 1955.

At the Botany Department, Allahabad University, India, *Aspergillus flavus* [*R.A.M.*, 31, p. 112] and *A. tamarii* [loc. cit.] were isolated from wheat grain stored at the University Agricultural Farm. The germination of the seed was severely reduced. The thermal death point of single-spore cultures of the former on Czapek's medium was 54° C. and of the latter 55°. Neither fungus grew at 6° and both had the highest dry weight at 20° with a slight reduction at up to 30° and a considerable one at 37°. Storage, especially of seed for sowing, at 15° is recommended.

Slykhuis (J. T.). **Aceria tulipae Keifer (Acarina : Eriophyidae) in relation to the spread of Wheat streak mosaic.**—*Phytopathology*, 45, 3, pp. 116–128, 4 figs., 1955.

Information already presented on the relation of *Aceria tulipae* to wheat streak mosaic virus in Alberta, Canada [*R.A.M.*, 33, p. 717], is recapitulated and the results of further observations are presented. It was demonstrated that the mite often carries an additional factor, possibly a virus, which is responsible for severe necrosis, chlorosis, and stunting; unlike wheat streak mosaic it has not been transmitted mechanically. Wheat streak mosaic virus could be acquired by nymphs but not by older adults of *A. tulipae*; when reared on diseased wheat all stages except the eggs carried the virus. The virus persisted for at least six days in the vector.

Maize and various cultivated and wild grasses, including *Echinochloa crus-galli*, *Digitaria sanguinalis*, *Eragrostis cilianensis*, *Panicum miliaceum*, *Setaria italica*, *S. verticillata*, and *S. viridis*, were more readily infected with wheat streak mosaic by means of the mite than by mechanical inoculation. The disease was transmitted to barley and oats by both methods. Wheat was the most favourable of the hosts tested for rearing the mites, though barley, rye, several wild annual grasses, and the perennial *Poa compressa* and *Oryzopsis hymenoides* could be substituted for this purpose. All stages of the mite survived the winter on wheat at lower temperatures than hardy varieties, e.g., Yogo, of their hosts artificially hardened and exposed to subfreezing temperatures. They also survived long enough on infested leaves buried in the soil or placed on its surface to attack wheat sown six days later. Since the mites perished rapidly on desiccated or partially decomposed leaves, the rate of elimination was influenced by temperature and moisture conditions in the soil. The eggs hatched readily at 25° C. and a relative humidity approaching 100 per cent., but the process was almost completely arrested at 15° and 5°. Similarly, very few eggs hatched at even 25° when the relative humidity was reduced to 75 per cent., and none at or below 50 per cent. The disease can, however, be eliminated by the destruction of all living diseased and infested plants by cultivation.

Sill (W. H.), Fellows (H.), & King (C. L.). **Kansas Wheat mosaic situation (1953–54).**—*Plant Dis. Reptr*, 39, 1, pp. 29–30, 1 map, 1955. [Multilithed.]

Wheat losses due to soil-borne wheat mosaic virus [*R.A.M.*, 33, p. 594] in Kansas in 1953–4 amounted to $3,000,000, as against $1,500,000 in 1951–2. The virus was prevalent in most counties in the eastern third of the State extending as far west as Reno, Sedgwick, Harvey, McPherson, and Saline counties. The varieties Concho and Comanche were highly resistant.

Wheat streak mosaic virus [34, p. 292], very widespread in most parts of the State except the south-east, was largely responsible, along with the early drought and extreme wind erosion, for yield reductions. Losses were estimated at

$14,000,000, second only to those of the 1949 outbreak ($30,000,000). The moderately tolerant Kiowa variety yielded well.

VANDERWALLE (R.). **Essai de conservation des spores de charbon nu du Froment et de l'Orge (Ustilago nuda et U. nuda tritici).** [An experiment on the preservation of the spores of loose smut of Wheat and Barley (*Ustilago nuda* and *U. nuda tritici*).]—*Parasitica*, 9, 4, pp. 139–144, 1 fig., 1 diag., 1953.

A technique is described by means of which the chlamydospores of *Ustilago nuda* and *U. n. tritici* [*U. tritici*] can be preserved over long periods without loss of germinability [*R.A.M.*, 33, p. 225; 34, p. 208]. The spores, prepared in the form of a powder or, more usually, in fragments of infected ears, are dried by means of a vacuum pump in glass tubes containing anhydrous gypsum. The whole drying operation does not exceed eight hours, terminating when all the moisture has been absorbed, and the vacuum is maintained at under 0·05 mm. of mercury without the assistance of the pump. The tubes are then sealed under vacuum, the gypsum usually being left in. Spores preserved by this method germinated after 12 months as well as fresh material, and in 18 as against 24 hours.

VANDERWALLE (R.). **Contribution à l'étude de l'infection florale du Froment et de l'Orge par le charbon nu (Ustilago nuda tritici et U. nuda Jens.).** [A contribution to the study of the floral infection of Wheat and Barley by loose smut (*Ustilago nuda tritici* and *U. nuda* Jens.).]—*Parasitica*, 9, 4, pp. 145–155, 1 fig., 1953.

In a critical study made at the State Phytopathological Station, Gembloux, Belgium, of the floral inoculation of cereals by smuts, inoculations were made on five wheat varieties with collections of *Ustilago nuda tritici* [*U. tritici*] from four varieties. The technique employed was that already described [*R.A.M.*, 25, p. 106], involving inoculation of the whole ear with a suspension of the spores in water. The conditions were kept as uniform as possible throughout, and in each case the concentration of the inoculum used was 1 gm. of spores per l. water, with an average vacuum of 60 mm. of mercury. The inoculated ears were collected according to varieties and each ear was kept in a separate paper bag. Some ears were taken at random from each line for embryo tests, and the others were kept for sowing in the greenhouse or the field. Each ear was sectioned into three parts, the level of infection being determined for each part separately.

The distribution of loose smut from a single source in any given variety was shown to be very irregular, some ears becoming infected and others not, while in individual ears, sometimes the apex became infected, and sometimes the base. The results demonstrated that the distribution of infection did not correspond with any determined physiological condition of the ear; there was an individual variation in susceptibility in each spikelet. This emphasizes the danger of using the data obtained from a single floral infection to establish the relative susceptibility of different lines or to determine biotypes.

Examination of the embryos for mycelium indicated an incidence of infection higher than in field and greenhouse tests. The embryo method gives rapid results, reduces the risks attendant upon cultivation in the open, and, in particular, eliminates inaccuracies, particularly prevalent in the greenhouse, due to latent infections.

AEBI (H.) & INGOLD (M.). **La prévention du charbon nu du Froment et de l'Orge.** [The prevention of loose smut of Wheat and Barley.]—*Rev. rom. Agric.*, 9, 8, pp. 61–63, 2 figs., 1953.

The authors state that the increase of loose smut of wheat (*Ustilago tritici*) and barley (*U. nuda*) in Switzerland [*R.A.M.*, 34, p. 211] makes increased vigilance necessary in the application of preventive measures. Locally, infection seldom

exceeds 1 per cent. (equivalent to five or six smutted ears per sq. m.); this has no appreciable affect on food crops, but any increase might endanger seed production; for this purpose, if fields have more than five smutted ears per are they are considered unsuitable. In 1951, 1·75 per cent. of the total area of autumn wheat and 1·84 per cent. of the barley inspected for certification were rejected, the corresponding figures for 1952 being 4·58 and 14·42 per cent. Control is recommended by the use of certified seed or seed from crops with not more than five smutted ears per are, by seed disinfection, and the development of resistant varieties. Two years' tests indicated that Probus wheat is less severely affected than MC 245 and MC 268.

Russell (R. C.) & Tyner (L. E.). **The influence of temperature on the time required to control loose smut of Barley by means of spergon or water-soak treatments.** —*Canad. J. agric. Sci.*, 34, 5, pp. 533–538, 1954.

Further work at the Plant Pathology Laboratories, Saskatoon, Saskatchewan, and Edmonton, Alberta [*R.A.M.*, 33, p. 78], was designed to determine the minimum temperature required for any length of time to secure control of barley loose smut (*Ustilago nuda*) [33, pp. 290, 527; 34, p. 144] by spergon or water-soak treatments. Complete control with minimum injury to the seed was obtained by soaking naturally infected Newal seed in 0·2 per cent. suspension of spergon (in open containers) at 72° F. for 48 hours or in water alone at 66°, 72°, 76°, or 86° for 80, 65, 55, or 35 hours, respectively. Spergon at 62° for 72 hours resulted in a nearly complete control.

Herbert (T. T.). **A new method of controlling loose smut of Barley.**—*Plant Dis. Reptr*, 39, 1, pp. 20–22, 1955. [Multilithed.]

At the North Carolina State College, Raleigh, barley seed, previously soaked in tap water for two to six hours, was kept in air-tight, 25 × 250 mm. test-tubes closed with rubber stoppers, then dried and stored in envelopes for three to five weeks before planting. The treatment resulted in effective control of loose smut (*Ustilago nuda*) [*R.A.M.*, 34, p. 144] with no appreciable reduction in germination. The length of time required for the anaerobic treatment varied inversely with the temperature, complete control being obtained at 32°, 28°, and 24° C. after 22, 31, and 42 hours, respectively, and when the tubes were only half full. Similar results were obtained with a soaking period of two, four, or six hours.

Tapke (V. F.). **Physiologic races in Ustilago nuda and techniques for their study.** —*Phytopathology*, 45, 2, pp. 73–78, 1 fig., 1955.

In addition to the differential barley varieties already mentioned in a preliminary note on physiologic specialization in *Ustilago nuda* [*R.A.M.*, 33, p. 225], Freja (C.I. 7130) was included in the studies herein fully described from the Plant Industry Station, Beltsville, Maryland. Race 1 comprised 63 per cent. of the total of 143 collections of the smut from 30 States of the Union, two from Canada, and one from Mexico, while race 4 (24 per cent.) was prevalent in the south and may be important on winter varieties. Races 2 and 3 represented 1·4 and 11·6 per cent., respectively, of the total.

Six two-rowed spring barleys, viz., Abyssinian (C.I. 668), Bifarb (C.I. 3951–3), C.I. 3694, C.I. 5798, Jet (C.I. 967), and Kitchin (C.I. 1296), tested for two, three or four years were immune from all four races. Jet was also immune from all the author's nine races of *U. nigra* [30, p. 407] and from seven of *U. hordei* [17, p. 308]; the remaining six of the latter (*Phytopathology*, 35, pp. 970–976, 1945) caused 2 to 12 per cent. infection. The reactions to *U. nuda* of 148 spring and 103 winter barleys are listed.

The following procedures were adopted to stabilize infection of the differential varieties. Most of the floral inoculations [*R.A.M.*, 26, p. 101; cf. 34, 361] were made

in a greenhouse to avoid interference by outdoor climatic variations during the flowering period of a fortnight or more. Only two-rowed barleys were used to obviate variability in infection due to the wide differences in floral development within a six-rowed head observed by Taylor and Harlan [23. p. 173]. Inoculum consisted exclusively of fresh, highly viable chlamydospores from greenhouse plants. Normally short-lived, some of these spores were still partly viable after 12 to 13 years' storage at 28° to 32° F., while up to 90 per cent. smutted heads were produced by seeds from flowers inoculated with chlamydospores kept for seven years at the same temperature.

Floral inoculation of barley with *U. nuda* has often been reported to injure seed set and germination [17. p. 516; 28. p. 389]. In tests on 13 spring varieties with 19 collections, Goldfoil produced about 66 established plants from every 100 inoculated flowers compared with only 21 for Kutan (C.I. 1466), the figures for the remainder being intermediate.

Cloninger (C. K.) & Poehlman (J. M.). **Resistance of winter Barley to Ustilago nuda (Jens.) Rostr.**—*Res. Bull. Mo. agric. Exp. Sta.* 360, 35 pp., 12 figs., 1954.

At the University of Missouri Agricultural Experiment Station, Columbia, 58 varieties and selections of winter barley were inoculated by Poehlman's method [*R.A.M.*, 25, p. 30] with four or more of 34 collections of *Ustilago nuda* [29, p. 35; 33, p. 225] from ten States. The collections could be arranged in 13 physiologic groups on a basis of their effects on six winter barley varieties, namely, N.C. Hooded 26, B 351, B 405, B 580, Dohadak, and Reno. The rough- and smooth-awned Tennessee winter-type varieties and the introduced commercial varieties commonly grown in the United States were susceptible (11 per cent. or more infected heads) to all collections with which they were inoculated.

Hooded varieties of Tennessee beardless and similar parentage served as an excellent source of resistance to many of the collections [32, p. 180], and selections from Missouri Early Beardless (M.E.B.) were resistant to a great number of them. Hybrid selections of M.E.B. parentage varied in their response according to the collection and selection used; several were good sources of resistance.

North Carolina Hooded 26; Hooded 16; M.E.B. selection B 351: Kinroku selection B 467; B 575 (Admire×M.E.B. sel.); C.I. 4966, an introduction from Russia (immune from all five collections tested, including the most virulent); and B 696 (Kentucky 2×M.E.B. sel.) were all resistant.

Atkinson (T. G.) & Shaw (M.). **Occurrence of acid phosphatase in association with the haustoria of powdery mildew on Barley.**—*Nature, Lond.*, 175, 4466, pp. 993–994, 5 figs., 1955.

As part of a cytochemical investigation of haustorial development in *P[uccinia] graminis tritici* and the barley powdery mildew fungus, *E[rysiphe] graminis* [*R.A.M.*, 33, p. 440], in the Department of Biology, University of Saskatchewan, an examination of strips from mildewed barley epidermis revealed a relatively high concentration of acid phosphatase within or on the haustoria, probably playing an important part in transferring metabolites between host and parasite. It is suggested that the critical application of cytochemical methods, particularly those for demonstrating enzymes, may constitute a fruitful approach to the many problems in physiological plant pathology and the study of disease resistance. In this work the methods of G. Gomori (*Stain Technol.*, 25, p. 81, 1950) and J. F. Burton (*Histochem. & Cytochem.*, 2, p. 88, 1954), particularly the former, gave the best results.

Bruehl (G. W.). **Barley adaptation in relation to Pythium root rot.**—*Phytopathology*, 45, 2, pp. 97–103, 2 figs., 1 graph, 1955.

In experiments in south-central South Dakota covering the period from 1948

to 1952 early barley varieties yielded less and appeared to sustain more damage from root rot, caused predominantly by *Pythium arrhenomanes* [cf. *R.A.M.*, 11, p. 435], than did adapted ones of medium to late maturity. An unsatisfactory performance was most common in varieties from Egypt, Afghanistan, Algeria, and India, where the grain is usually autumn-sown. The long periods of light following spring sowing in South Dakota accelerated maturity in these barleys to a degree precluding optimum yields. In one test, for instance, only 32, 34, 57, and 66 per cent., respectively, of the varieties from the above-mentioned countries (in the order named) produced adequate yields compared with 97, 93, and 93 per cent., respectively, of those from Manchuria, Ethiopia, and Iraq.

In greenhouse experiments with four early and four late varieties in sand-nutrient cultures of the fungus, all headed with a photoperiod of 18 hours, whereas only Atsel and Vaughn did so with nine hours. The long period of light resulted in a total of 102 heads on the early varieties (Olli and Plains besides the above-mentioned) compared with 57 on the late Peatland, Montcalm, Vantage, and Plush. The numbers of tillers in the early varieties exposed to 18 and nine hours of light were 45 and 15, respectively, and the corresponding figures for the late ones 21 and 36, respectively. In two other tests in a low phosphorus nutrient solution Plains and Atsel tillered more abundantly with 15 than with nine hours of light. California Mariout, Roho, and Vaughn produced well under both conditions, while Montcalm, Plush, and O.A.C. 21 (late) were more prolific in the shorter photoperiod.

The correlation of field yields with root weight in the 15-hour-inoculated greenhouse series indicated that the root rot reactions of several varieties were revealed only under adequate periods of light, and that the disease was a factor in the assignment of varietal rank in the field. Tolerance of *P. arrhenomanes* appears to be linked with the growth rate and development of the plant, which in turn is modified by photoperiodicity.

Johnson (T.) & Buchannon (K. W.). **The reaction of Barley varieties to Rye stem rust, Puccinia graminis var. secalis.** —*Canad. J. agric. Sci.*, 34, 5, pp. 473–482, 1954.

Greenhouse and field varietal trials with barley at the Canada Department of Agriculture, Winnipeg, Manitoba, confirmed previous findings that a number of varieties resistant to wheat stem rust (*Puccinia graminis* var. [f.sp.] *tritici*) [*R.A.M.*, 34, p. 289] are susceptible to the rye strain (*P. g.* var. [f.sp.] *secalis*). Most of the rust collections from rust-resistant barleys were of rye stem rust. Little indication of mature plant resistance was obtained from seedling leaf reaction. Of the 270 barley accessions tested, only Black Hulless C.I. 666 possessed a reasonably high resistance to rye stem rust and was the only one showing any degree of resistance in field plots in 1952. It showed little resistance in field tests to race 15B of *P. g. tritici*, carrying 15 per cent. infection of a susceptible type. Wisc. H 106.1, Valentine, Vantage [34, p. 432], and Chevron were resistant to 15B. Rye stem rust, while not a threat to barley production at present, is regarded as a potential danger.

Welsh (J. N.), Carson (R. B.), Cherewick (W. J.), Hagborg (W. A. F.), Peturson (B.), & Wallace (H. A. H.). **Oat varieties—past and present.**—*Publ. Canad. Dep. Agric.* 891, 51 pp., 7 figs., 1953.

Brief notes are given on the chief diseases affecting oats in Canada and the United States, including *Puccinia graminis* [*R.A.M.*, 32, p. 667], *P. coronata*, *Ustilago kolleri*, *U. avenae*, *Helminthosporium victoriae* [33, p. 345], *Fusarium* spp., *Pythium* spp., *Colletotrichum graminicola* [32, p. 76], *Rhizoctonia* [*Corticium*] *solani* [30, p. 459], *Ophiobolus graminis* [32, p. 269], *Cercosporella herpotrichoides* [cf. 30, p. 306], *Pseudomonas coronafaciens* [33, p. 139], *P. striafaciens*, *Sclerospora macrospora* [32, p. 248], *Erysiphe graminis* [32, p. 675], *Leptosphaeria avenaria* [33,

p. 149], *Scolecotrichum graminis*, oat mosaic virus [33, p. 291], oat red leaf [32, p. 553], *Pseudodiscosia avenae* [19, p. 74], *Fusarium nivale* [*Calonectria nivalis*: 32, p. 552], blast [19, p. 372], and grey speck due to manganese deficiency [32, p. 542]. The remainder of the booklet is devoted to descriptions of the history and characteristics of the chief North American oat varieties.

Harper (J. L.), Landragin (Phyllis A.), & Ludwig (J. W.). **The influence of environment on seed and seedling mortality. I. The influence of time of planting on the germination of Maize. II. The pathogenic potential of the soil.**—*New Phytol.*, 54, 2, pp. 107–118, 119–131, 1 diag., 8 graphs, 1955.

In the first of this series of experiments designed to determine the causes and extent of mortality in maize seed and seedlings [cf. *R.A.M.*, 33, p. 345] several varieties including Virginian White Horsetooth, Nodak 301, County Gentleman, Wisconsin 275, Sibthorp, and open-pollinated seed produced at Oxford from the Wisconsin hybrids 483 × 177, 478 × 336, and 465 × 18 were sown at weekly intervals in the spring and autumn of 1952 and from early spring to late summer in 1953 in experimental plots previously used for maize at Sandford-on-Thames, near Oxford. The number of emerged seedlings differed markedly according to date of sowing and variety, and was almost entirely associated with the time taken for emergence. Most of these differences were removed when this effect was allowed for in the statistical analysis.

Since the orthodox laboratory germination tests give little indication of what the varietal performance is likely to be in the field, a cold test giving a close indication of the probable field behaviour and similar to that used in America is described [loc. cit.]. Six replicate samples of 50 seeds of each variety were sown in fibre pots of sifted soil which were stood in shallow trays of water to maintain the soil near field moisture capacity at a temperature of 5° C. for ten days and thereafter at 23°. The values recorded by this test were percentage germination and percentage emergence.

In the second series seed of the varieties Wisconsin 275 and Virginian White Horsetooth subjected to the cold test method in soil from the field plots suffered heavy mortality caused mainly by [unspecified] soil-borne pathogens. This was prevented almost entirely by soil sterilization or seed treatment with a dust fungicide. Surface sterilization of the seed was completely ineffective. The degree of mortality differed markedly according to the date on which the soil was taken from the plot and appeared to be correlated partly with the soil moisture content. Even after allowing for this, highly significant variations remained between sampling dates. Therefore the 'pathogenic potential' of the soil varied with time and the soil moisture content. Although mortality was greatest at a high moisture content, the proportion occurring in the post-germination phase was higher in the drier soil samples.

Wilt wilts bankrolls of Sweet Corn growers.—*N.J. Agric.*, 39, 4, p. 15, 2 pl., 1953.

Bacterial wilt of maize [*Xanthomonas stewarti*: *R.A.M.*, 32, p. 676] was severe in New Jersey in 1953, and N.J. hybrids 101 and 106, grown from seed produced in New Jersey, were almost unaffected. The same hybrids grown from seed produced in Idaho, however, were much less resistant. If the winter index [loc. cit.] is above 100 the flea beetle which spreads the disease survives, and wilt-resistant varieties only should be planted the following season.

Chapot (H.). **Le 'quick decline' à Madagascar et les porte-greffes locaux.** [Quick decline in Madagascar and the local stocks.]—*Fruits d'outre-mer*, 8, 9, pp. 437–439, 4 figs., 1953. [Received 1954.]

There appears to be little doubt that quick decline is present on citrus in

Madagascar, as various stocks originating from South Africa, notably Washington Navel and Makali orange, Tahiti and Persian lime, Natal Light mandarin, calamondin, and Cleopatra tangerine, develop the typical chlorosis, centripetal defoliation and withering of the branches, with premature blossoming and fruit formation, when grafted on to grapefruit stocks. Fortunately, certain local stocks, including notably the variety 'Voangibe', closely resembling rough lemon, are tolerant of the virus and 'Combava', a form or hybrid of *Citrus hystrix* and 'Voangasahy', a self-rooted mandarin, are resistant.

Miller (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 3, 2, pp. 24–26, 1954.

Late in July, 1953, rough lemon seedlings at Thermal, Coachella Valley, California, in a shaded seed-bed with a temperature at the time of observation of 34° C. and watered by basin irrigation, became affected by damping-off. *Pythium aphanidermatum* was isolated from diseased material, and inoculations of potted sweet orange and rough lemon seedlings at sowing or upon emergence with hemp-seeds upon which *P. aphanidermatum* from affected rough lemon seedlings had been grown caused damping-off in 53 hours.

Nagaraj (A. N.), Davis (T. A.), & Menon (K. P. V.). **Sap transfusion, a new device for virus transmission trials in Palms.**—*Indian Coconut J.*, 7, 3, pp. 91–98, 5 figs., 1954.

Palms affected by the wilt or root disease [*R.A.M.*, 33, p. 293] in the central coco-nut-growing area of Travancore and Cochin, India, display typical root symptoms, including basipetal necrosis of the rootlets and browning of the cortex. In some apparently healthy roots a hard hypodermis forms, and as the disease advances new roots cease to develop.

At the Central Coconut Research Station, Kayangulam, a technique was devised to investigate the possible virus nature of this disease by joining a severed root tip from a diseased tree to the cut upper end of a root from a nearby healthy one by means of rubber tubing filled with sterile water. Sap was forced up from the diseased tip into the healthy tree. In a second method, root formation was induced in a wooden box at a convenient height on the trunk and extracts from infected palms were watered onto the uncut rootlets. Absorption, however, was slow and selective, and it was found more satisfactory to administer the extracts through the cut ends of mature, basal roots.

Pandalai (K. M.), Sankarasubramony (H.), & Menon (K. P. V.). **Observations on the sudden wilting of Coconut Palms at Thottapally Spill Way Area in Travancore-Cochin.**—*Indian Coconut J.*, 7, 3, pp. 107–116, 7 figs., 1954.

In the course of dredging operations near Thottapally in Travancore-Cochin, India, healthy coco-nut palms in an area where peaty subsoil had been deposited were affected by a wilt [cf. preceding and next abstracts] causing death in six to eight weeks. Leaves of the outermost whorl drooped and dried up first, followed by the rest of the crown which eventually broke off. The wilt was shown to be physiological, due to the acidity of the subsoil water, an increase in iron and aluminium to toxic concentrations, and the setting up of anaerobic conditions round the roots.

Radha (K.) & Menon (K. P. V.). **Studies on the wilt (root) disease of the Coconut Palm.**—*Indian Coconut J.*, 7, 3, pp. 99–106, 6 graphs, 1954.

In a comparison at the Central Coconut Research Station, Kayangulam, of the rhizosphere microflora of healthy coco-nut palms and those from wilt-affected areas [see preceding abstracts] lower numbers of micro-organisms were isolated from the rhizospheres of diseased palms than from healthy ones. As the disease advanced

there was a decrease in the population of fungi and bacteria and an increase in that of actinomycetes. Higher numbers of *Aspergillus* spp. and lower counts of *Penicillium* were associated with diseased than with healthy trees. Two strains of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 33, p. 294] were isolated from the roots of infected palms but not from those of healthy ones. *R. bataticola* [*Macrophomina phaseoli*: loc. cit.] was more frequent in diseased than in healthy areas, while *Botryodiplodia theobromae* [loc. cit.] was the dominant fungus on all the roots. *Neocosmospora vasinfecta* and species of *Gloeosporium*, *Gliocladium*, *Pestalotia*, *Fusarium*, *Curvularia*, *Chaetomium*, *Trichoderma*, and *Mucor* also occurred frequently.

Sechet (M.). **Sur quelques parasites des feuilles de Cocotier dans l'ouest de Madagascar et aux Comores.** [On some parasites of the leaves of the Coco-nut in western Madagascar and in the Comoros.]—*Oléagineux*, 10, 6, pp. 414–415, 1 fig., 1955.

Coco-nut leaves from the Sambirano Valley, Madagascar, bore large, irregular, grey spots, more clearly defined than those caused by the common *Pestalotia palmarum* [*R.A.M.*, 33, p. 590], and surrounded by a brown margin usually less than 1 mm. wide. The hard, black, submerged perithecia contained hyaline asci accompanied by a few filiform, generally flexuous paraphyses of approximately 1 μ diameter. The asci, 50 to 75 by 7 to 11 μ, each contained eight bicellular, hyaline, fusoid ascospores, 10 to 16 by 2·5 to 4·5 μ, rounded at both ends. The name *Didymella cocoina* n.sp. is proposed for this species.

On coco-nut leaves from the island of Anjouan there were similar blotches, grey, oblong, and surrounded by a slightly raised, reddish brown margin with an internal blackish brown edge. These lesions often interfere with those of *P. palmarum*. Exactly similar blotches were found on leaves from Great Comoro. Both were studded with small, isolated, carbonaceous, subepidermal perithecia about 100 to 150 μ diameter. The asci measured 25 to 45 by 6 to 8 μ and the ascospores 8 to 12 by 2·5 μ. The fungus agrees well with *Mycosphaerella gastonis*.

On the Great Comoro specimens also there were blotches exactly similar to those described, bearing submerged pycnidia appearing as paler protuberances surrounded by a brown ring. They measured 70 by 150 μ, the base rarely sinking beneath the subepidermal layer; they were connected with a thick brown mycelium ramifying throughout the whole thickness of the mesophyll. The non-septate spores measured 2·5 to 4 by 1 μ. It may represent the imperfect form of the preceding and is named *Phyllosticta comoriana* n.sp.

Duruz (W. P.). **Spray controls Coffee blight in Nicaragua.**—*For. Agric.*, 17, 11–12, pp. 204–205, 3 figs., 1953.

Coffee blight due to *Corticium koleroga* [*R.A.M.*, 32, p. 616] causes losses of 10 to 50 per cent. every year in some plantings in Nicaragua, amounting to as much as 70 per cent. in 1952. Studies at the Servicio Técnico Agrícola, administered jointly by Nicaragua and the United States, have shown that the disease can be controlled effectively by thorough spraying (to reach the under-surfaces of the leaves) two or three times early in the rainy season with a copper fungicide such as cuprocide at the rate of 2½ lb. to 50 gals. water plus 1¼ lb. of adhesive oil, using knapsack or power sprayers.

Thomas (K. M.). **Fifth Annual Report of the Research Department of the Indian Coffee Board (1951–52).**—*Bull. Indian Coff. Bd Res. Dep.* 5, 80 pp., 1953. R. 1.

It is stated in this report [cf. *R.A.M.*, 30, p. 366] that the coffee (*Coffea arabica*) seedling S. 446 gave outstanding yields at Chethalli, and though some spots [due to *Hemileia vastatrix*: 32, p. 185] were observed in January and February, there was no extensive defoliation. S. 702 and S. 838 were disease-free but less vigorous than

S. 446. Selections 1, 2, 3, and 4 of *C. arabica* hybrids from Kurkenmutty were resistant and produced vigorous growth. Crosses between the *C. robusta* lines 53–33 and 58–31 grew well and were disease-free. The mother plants of 53–28 and 49–28 at Ghattedhulla are reported to be susceptible to *H. vastatrix*, but the crosses between these plants remained healthy.

In trials conducted at Chethalli in 1951 for the control of *H. vastatrix*, copper sandoz (2 lb. in 40 gals.) and Bordeaux mixture (2–2–40) failed to increase leaf counts, but the latter gave better yields, i.e. 2·36 cwt. per acre as against 1·74 for the former and 0·75 for the untreated.

The abnormal leaf fall [cf. 33, p. 141], usually after a wet spell, first reported in the Bababudangiris and since from most of the coffee-growing areas, was found by leaf analysis to be related to low nitrogen and potassium and a high ratio of carbon to nitrogen, indicating that essential carbohydrates and nitrogen are withdrawn from the older leaves to provide for the new flush. There was an accumulation of nutrients in the petioles of fallen leaves.

Green bug (*Lecanium viride*) is reported to be increasing in importance on coffee in the predominantly northeastern monsoon areas, where recent dry weather has reduced the spread of the entomogenous fungus *Empusa lecanii*. In the south-western monsoon regions the bug is controlled by *Cephalosporium lecanii* [cf. 28, p. 378].

Juniper (A. J.). **Dactylaria pyriformis sp.nov.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 437–440, 2 figs., 1954.

A description is given of *Dactylaria pyriformis* n.sp. which, by means of sticky networks, captures nematodes. It was isolated from maize-meal agar plates inoculated with fragments of manure from Nocton Fen, Lincolnshire, in May, 1953, and produced heads of pyriform conidia.

Drechsler (C.). **Some hyphomycetes that capture Eelworms in southern States.**—*Mycologia*, 46, 6, pp. 762–782, 6 figs., 1954.

Descriptions are given of three new species of Hyphomycetes, *Arthrobotrys anchonia*, *Dactylella megalospora*, and *D. phymatopaga*, found capturing nematodes in decaying vegetable matter from Florida and Louisiana [cf. *R.A.M.*, 32, p. 313; 33, p. 423, *et passim*].

Deshpande (R. B.) & Jeswani (L. M.). **A note on the results of performance tests of N.P. rust resistant strains of linseed in the different States of India.**—*Indian J. Genet.*, 14, 1, pp. 22–38, 1954.

From the results of tests of rust (*Melampsora lini*) resistant linseed varieties [*R.A.M.*, 32, p. 79; 34, pp. 349, 578] carried out by the Indian Agricultural Research Institute, New Delhi, in various States, it is concluded that the immune New Pusa strains are superior in yield to the best local strains. One variety, N.P. R.R.9, showed good resistance to wilt (*Fusarium lini*) [32, p. 544] at Kanpur, Uttar Pradesh, in 1952–3.

Bouwman (L. W. M.) & Noordam (D.). **Komkommermozaiekvirus in Buddleia davidii Franch.** [Cucumber mosaic virus in *Buddleia davidii* Franch.]—*Tijdschr. PlZiekt.*, 61, 3, pp. 79–81, 3 figs., 1955. [English summary.]

In July, 1954, material from a *Buddleia davidii* plant showing symptoms of a virosis was collected at Boskoop, Holland. The leaves, especially near the inflorescence, were unusually narrow, sometimes twisted and curled, and the margins mostly entire (instead of serrated) and irregular; in some cases they were faintly mottled.

Transmission of sap from the diseased foliage to White Burley tobacco, *Nicotiana glutinosa*, and cucumber gave positive results on the first-named only, about one-third of the plants developing lumpiness of one of the inoculated leaves and a faint,

yellow patterning of the same leaf and others. Tobacco plants inoculated with sap from these plants reacted by the formation of irregular, yellow spots on the leaves, later merging into a fine, reticulate, yellow pattern. *N. glutinosa* showed a slight mosaic, beginning with chlorosis of the veins, which later spread to the interveinal areas. Typical mosaic symptoms developed on cucumber leaves, with yellow rings on the seed lobes. The results of a cross-protection test on tobacco with the yellow strain of cucumber mosaic virus [*R.A.M.*, 14, p. 5 *et passim*] demonstrated that the virus of *B. davidii* was a strain of that virus. This is believed to be the first report of the disease on *Buddleia* in Holland, though it has been described in England by K. M. Smith [31, p. 238].

Servazzi (O.). **La fusariosi delle 'Sansevieria' ornamentali.** [Fusariosis of ornamental species of *Sansevieria*.]—Reprinted from *Ann. Fac. Agr. Sassari*, 1 (*1953*), 19 pp., 2 figs., 1953. [Received 1954.]

A disease of *Sansevieria zeylanica* was observed for the first time in May, 1950, on plants received at the Plant Pathology Institute, Sassari, Sardinia, from San Remo, Liguria, and has since been found on all the ornamental varieties, namely, *S. thyrsiflora* and *S. zeylanica* vars. *laurentii* and *craigii*, on the Ligurian Riviera, and also at Turin and Monte Carlo on plants originating from Liguria. In view of the popularity of this plant and the fact that this is the principal region for its cultivation the disease is probably present throughout Italy. The lesions, 3 to 4 by 1 to 1·5 cm., usually up to three in number, were at first dry, brownish-orange to brownish-yellow, depressed, irregular, and confined to the upper leaf surface, generally parallel to the midrib. Later they became depressed more rapidly than they elongated to assume a crateriform or cankered appearance, and eventually dropped out; when numerous they coalesced. The damage is more serious in young leaves where the lesions tend to split longitudinally, parallel to the vein. The necrotic zones yielded conidia of *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [cf. *R.A.M.*, 19, p. 600], which constitutes a new record for both Italy and Europe; it may be a biologic form of the fungus commonly occurring on maize. Typical lesions first appeared on leaves of *S. zeylanica* var. *laurentii* 14 days after inoculation with a spore suspension of the fungus; after 20 days all leaves were infected. Good results were obtained by treatment with Bordeaux mixture or with fuclasin (zinc dithiocarbamate) plus a wetter.

Pelluchi (Luisa). **Le macchie clorotiche ad anello su Saintpaulia ionantha in Italia.** [Chlorotic ring spots on *Saintpaulia ionantha* in Italy.]—*Ann. Sper. agr.*, N.S., 7, 6, pp. 1705–1708, 3 figs., 1953. [English summary.]

A chlorosis of *Saintpaulia ionantha*, often in the form of a ring, was observed on plants in the Botanical Garden, University of Pavia; it appears to be recorded for the first time from Italy. It is thought to be due to unfavourable environmental conditions, not to a virus. No X-bodies could be found in the leaf cells.

Leach (C. M.). **Equipment and methods for the isolation of pathogens from Clover seed.**—*Phytopathology*, 45, 2, pp. 94–96, 5 figs., 1955.

An improved method for the isolation of pathogens from clover and other small-seeded legumes has been devised at the Oregon Agricultural Experiment Station. It involves the use of special equipment, designed to accelerate the preparation and plating of both treated and untreated seed and consisting of a seed-disinfecting apparatus, an aseptic seed-drier, and two vacuum counters for plating. The disinfecting apparatus comprises a cylindrical copper disinfectant chamber and two wire-mesh seed-containers. Using this technique, 800 dried clover seeds can be plated within 30 minutes and fungus colonies are usually distinguishable in seven days on malt agar incubated at 70° F.

Brooks (R. M.) & Olmo (H. P.). **Register of new fruit and nut varieties. List 9.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 535–549, 1954. [Received June, 1955.]

In this further list of new fruit and nut varieties developed in the United States and Canada [cf. *R.A.M.*, 33, p. 490] are included the new blackberry Jerseyblack (New Jersey 16) from Evergreen × Eldorado, resistant to rust [*Kuehneola uredinis*: 29, p. 469]; the blueberry [*Vaccinium* sp.] Croatan (North Carolina 257) from Weymouth × F–6, resistant to canker [*Physalospora corticis*: 32, p. 386] in eastern North Carolina; and the vine Lake Emerald from Pixiola (*Vitis simpsoni*) × Golden Muscat, which is resistant to lucerne dwarf virus [33, p. 577]. The nectarine variety Globerta (Glogold) from selfed Fuzzless-Berta peach is apparently resistant to brown rot [*Sclerotinia fructicola*: 33, p. 490]. Resistance to fireblight [*Erwinia amylovora*: 34, p. 377] is claimed for the pear varieties Ayres (Tennessee 37521) from Garber × Anjou, Dabney (Tennessee 35583) from Seckel × Garber, Hoskins (Tennessee 38510) from Seckel × Late Faulkner, and Mooers (Tennessee 345272) from Duchesse d'Angoulême × Late Faulkner, which is also resistant to leaf spot [*Fabraea maculata*: 33, p. 431]. The pecan variety Elliott, of unknown parentage, is highly resistant to scab (*Cladosporium effusum*) [33, p. 469].

Luckwill (L. C.). **Virus diseases of fruit trees : IV. Further observations on rubbery wood, chat-fruit and mosaic in Apples.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 40–46, [1954].

In further studies in this series at Long Ashton Research Station [cf. *R.A.M.*, 30, p. 330] the distribution of apple latent rubbery wood virus [33, p. 89] in samples of M.I and M.II rootstocks from stoolbeds in different parts of the country was investigated by budding with virus-free Lord Lambourne. All the seven samples of M.II and two (obtained from nurseries which had established their parent stocks before 1930) out of six samples of M.I were virus-free. Of the seven different Malling stocks from the Long Ashton stoolbed indexed for latent chat-fruit virus [30, p. 325], M.IV, M.XVI, and M.XII showed 22, 6, and 4 per cent. infection, respectively, while M.I, M.II, M.VII, and M.IX were apparently virus-free. Of the 42 varieties tested against the vein-banding strain of apple mosaic virus [loc. cit.; 31, p. 440] by top-working on infected Lord Lambourne seven were tolerant, 13 partially tolerant, and 22 susceptible.

Transmission experiments with buds taken from large apple trees which had shown localized mosaic virus symptoms for at least eight years demonstrated that the virus was not fully systemic.

Bovey (R.). **Les maladies à virus des arbres fruitiers. I. Pommier et Poirier.** [Virus diseases of fruit trees. I. Apple and Pear.]—*Rev. rom. Agric.*, 9, 9, pp. 73–75, 5 figs., 1953.

Brief notes, based on the literature and on the author's observations in Switzerland [*R.A.M.*, 34, p. 230] are given on the symptoms of the following virus diseases. On apple, mosaic [loc. cit.], proliferations [proliferation disease], rubbery wood [loc. cit.], flat limb [loc. cit.], and branch swellings are recorded, and on pear, mosaic [loc. cit.] and stony pit [cf. 32, p. 386]. Apple mosaic is not uncommon in Switzerland. Proliferation disease [33, p. 33], prevalent in French-speaking Switzerland, where it causes considerable damage in some orchards, is characterized by the premature opening of the axillary and terminal buds. A few flowers may appear at the end of the season. The leaves on the secondary branches are small, elongated, finely and irregularly dentate, and sometimes light green to yellow, or reddish. The fruits ripen badly and late, and remain small. Affected trees often have a weak growth. These symptoms appear irregularly, affecting sometimes one part of the tree, sometimes another; they may disappear for some years and reappear later. Susceptible varieties include Golden Delicious, Winter Banana,

Starking, Jonathan, Cox's Orange, and Belle de Boskoop. The condition referred to as branch swellings appears to be due to a virus, but has not yet been experimentally transmitted. It was found in 1952 on the Ontario variety at Penthalaz. Swellings resulting from an excessive growth of wood and bark in certain places appear on branches that are a few years old. Affected trees lack vigour, have a sparse foliage, and give a poor yield of undersized fruits. Pear trees affected by stony pit improve when double-grafted on to Williams' Bon Chrétien. [This paper also appears in *Fruits Prim. Afr. N.*, 23, 250, pp. 372–373, 1953.]

Wade (G. C.). **Black spot of Apples and Pears. Results of investigations in seasons 1951–52, 1952–53.**—*Tasm. J. Agric.*, 24, 3, pp. 197–208, 4 figs., 1953.

In further trials against apple black spot [scab] (*Venturia inaequalis*) [*R.A.M.*, 31, p. 416] and ripe spot (*Gloeosporium* sp.) [*Neofabraea malicorticis* or *N. perennans*: 32, p. 436] in Tasmania in 1951–3 thiram (1½ lb. per 100 gals.), applied at calyx and first cover, gave outstanding control and nearly eliminated russeting [cf. 34, p. 460]. Good control was also obtained with captan (2 lb. per 80 gals.), but russeting was increased and fruit size reduced. Against *V. pirina* on pears, thiram was effective; Bordeaux mixture (3:2:40), though even better, increased russeting.

Miller (L. W.). **Effects of certain new fungicides on the European red mite in Tasmanian Apple orchards.**—*Tasm. J. Agric.*, 24, 3, pp. 209–212, 1 graph, 1953.

The replacement of sulphurs by thiram for the control of apple black spot [scab] (*Venturia inaequalis*) [see preceding abstract] in many Tasmanian orchards in 1952–3 resulted in an increased population of the European red mite (*Paratetranychus pilosus*). A heavy carry-over of overwintering eggs is likely and the continued use of thiram might cause serious problems. Captan has a similar effect. Earlier spraying for the control of red mites is recommended.

Pavićević (B. M.) & Stančević (A. S.). **Osetljivost raznih sorti Jabuka prema čadjavoj krastavosti.** [Susceptibility of various varieties of Apples to scab.]—*Arh. poljopr. Nauk.* [*Trans. Inst. Agron. Res.*], 7, 15, pp. 106–113, 1954. [English summary. Received 1955.]

Investigations carried out in 1953 by the Institute of Fruit Growing, Čačak, in 12 different parts of Serbia, Yugoslavia, on resistance to apple scab (*Venturia inaequalis*) [*R.A.M.*, 33, p. 371] have shown that the degree of susceptibility often varies within one variety according to external factors such as air humidity and circulation, spacing of the trees, crown density, and soil management. The following varieties showed the highest resistance: Red Astrakhan, Bauman's Reinette, White Calville, Beličnik, Belle de Boskoop, Buzdovanka, Viljemova, Damason's Reinette, Gdanska ružica, Zejtinka, Zelenika, Jonathan, Canada Reinette, Reinette of Coux, Reinette little Coux, Kronèelka, Coulon's Reinette, Lukasov ramburg, Mazenkova malinka, Maljenka, Mašanka, Mundi Gloria, Nonetit, Orijaška bojkinja, Ontario, Peasgood Reinette, Plameni Kardinal, Slavonska srčika, Topličanka, French Reinette, Funtača (ilinjača), Harbert's Reinette, Cigančica, Šećerlija, Štajerska mašanka, Šumatovka, and Tsar Alexander. The selection of resistant varieties is regarded as the best method of controlling the disease.

Plasman (A.). **Influence de pulvérisations automnales sur la formation des périthèces de Venturia inaequalis (Cooke) Winter et de V. pirina Aderh.** [Influence of autumn sprays on the formation of the perithecia of *Venturia inaequalis* (Cooke) Winter and of *V. pirina* Aderh.]—*Parasitica*, 9, 3, pp. 105–117, 1953.

In an experiment carried out at Gembloux. Belgium, to determine whether an

autumn spray would satisfactorily control the overwintering forms of *Venturia inaequalis* and *V. pirina* [cf. *R.A.M.*, 27, p. 326; 30, p. 373, *et passim*], 16 Doyenné du Comice pear trees and 16 Cox's Orange apple trees aged, respectively, four and five years were sprayed on 13th October, 1951, before leaf-fall, with a number of preparations.

On 22nd March, 1952, the numbers of perithecia on the treated and untreated leaves were assessed by the method of Darpoux and Vuittenez [29, p. 217] and the various treatments were rated according to an arbitrary scale in which 0 represented 75 per cent. as many perithecia present per unit area of leaf surface as in the untreated, 3 represented 0·1 to 1 per cent., and 4 under 0·1 per cent. The only effective treatment was ammonium dinitro-*o*-cresylate (DNOC), which rated 3 at 1 per cent. (0·8 per cent. of the active material) and 4 at 2 per cent., each tree receiving 250 ml. of solution. There appeared to be some relationship between phytocidal effect of the different products and efficacy in reducing the number of perithecia.

Darpoux (H.) & Perrot (A.). **Mise au point sur les procédés de lutte contre les tavelures du Pommier et du Poirier.** [An elucidation of the methods of control of scab of Apples and Pears.] —Reprinted from *Bull. Inform. C.R.A.F.* 5, 5 pp., 1953. [Received 1954.]

The author outlines the current position regarding the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*: *R.A.M.*, 34, p. 40] with reference to suppression of the development of fructifications, and fungicidal treatments with synthetic organic compounds such as captan, zineb, and ferbam [loc. cit.].

McIntosh (D. L.) & Mellor (F. C.). **Crown rot of fruit trees in British Columbia. III. Resistance trials on Apple seedlings obtained from controlled crosses.**—*Canad. J. agric. Sci.*, 34, 5, pp. 539–541, 1954.

In further studies in this series [cf. *R.A.M.*, 33, p. 609] at Summerland, British Columbia, apple seedlings from crosses between varieties resistant (Antonovka and McIntosh) and susceptible (Winter St. Lawrence and Yellow Transparent) to crown rot (*Phytophthora cactorum*) were inoculated with a mixed culture of four isolates of the fungus from apple and one from sweet cherry. The average disease percentage for the resistant × resistant crosses was 7·2 and for the resistant × susceptible 23·5, as against 93·3 for the susceptible × susceptible, indicating that the factors contributing to resistance are either partially or completely dominant and that resistance is inherited through either the male or female parent.

Kearns (H. G. H.), Marsh (R. W.), & Morgan (N. G.). **Spray application problems: XII. Further field experiments on the control of Apple scab by small-volume sprays.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 149–153, 2 diags., [1954].

In further field trials for the control of apple scab [*Venturia inaequalis*] at Long Ashton Research Station, Bristol [*R.A.M.*, 33, p. 158], in 1953 lime-sulphur (up to 1 per cent.) was used with 3 oz. (100 per cent.) dioctyl sodium sulphosuccinate wetter per 100 gals. spray. The varieties, machines, methods of application, and the lay-out of the experiments were the same as in 1952 [loc. cit.]. The season was favourable for scab development. Large-volume spraying (over 500 gals. per acre) by lances gave control, resulting in 21·5 per cent. scabbed Worcester Pearmain fruits (by weight) as against 96·4 for the untreated on one plot and no scab as against 78·2 per cent. on Worcester and 93·4 on Cox's Orange Pippin on another. Small-volume spraying (100 to 150 gals.) by means of an air-flow machine gave unsatisfactory control (67, 28, and 69·8 per cent. scabbed fruits, respectively).

Byrde (R. J. W.), Fielding (A. H.), & Harper (C. W.). **Spraying experiments against Apple and Pear scab at Long Ashton, 1953.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 167–170, [1954].

In further trials at Long Ashton Research Station for the control of apple and pear scab (*Venturia inaequalis* and *V. pirina*) [*R.A.M.*, 33, p. 158; cf. preceding abstract] 0·1 per cent. captan reduced the percentage fruit scab on Cox's Orange Pippin from 5·1 (untreated) to 0·91, compared with 1·99 for lime-sulphur, and increased yield from 0·2 bush. per tree to 2·8 as against 0·5. Both captan and 0·125 per cent. 2-heptadecyl glyoxalidine were effective as post-blossom scab sprays on sulphur-sensitive apple and pear varieties, reducing the percentage fruit scab to 0·03 and 0·08, respectively, on Lane's Prince Albert apples and to 0·31 and 1·1 as against 4·52 (untreated) on Williams' Bon Chrétien pears, with little or no phytotoxicity.

Byrde (R. J. W.) & Corke (A. T. K.). **The role of eradicant fungicides in the control of Apple canker. II.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 159–162, [1954].

A laboratory examination was carried out at the Long Ashton Research Station of apple cankers (*Nectria galligena*) [*R.A.M.*, 33, p. 90; 34, p. 367] from trees treated in the field during winter months with phenyl mercury chloride (0·3 per cent. suspension in 0·3 per cent. sulphite lye), sodium pentachlorophenate, and pentachlorophenol. Four cankers per treatment were immersed in distilled water and 18 hours later, after shaking and pouring the water off, were surface sterilized and placed on damp cotton-wool pads in sterile tubes, the mycelial and perithecial development being recorded after two months at room temperature. The washings were filtered and centrifuged for spore counts and germination tests. The results confirmed the previous findings [32, p. 567] that phenyl mercury chloride had a more lasting effect than the other two fungicides; two applications, in November, 1951, and October, 1952, reduced sporulation, spore viability, and the activity of the fungus within the tissues until the end of March, 1953, and appeared to reduce leaf scar infection.

Byrde (R. J. W.). **Observations on the sporulation of Sclerotinia fructigena on mummified Apples and Plums in late spring and summer.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 163–166, 3 graphs, [1954].

Preliminary observations at Long Ashton Research Station, Bristol, on the date of occurrence of fresh pustules of *Sclerotinia fructigena* on overwintered mummified apples [*R.A.M.*, 34, p. 158] and plums [32, p. 569] during April, May, and June, each year from 1951 to 1953, inclusive, in relation to the Station's meteorological records indicate that a combination of moderate rainfall and relatively high overnight temperatures is responsible for outbreaks of sporulation.

Hobbis (E. W.) & Marsh (R. W.). **The infection of Apple stems through wounds caused by geese.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 89–90, 1 pl., [1954].

In 1954 *Gloeosporium* [*Neofabraea*] *perennans* caused cankers on apple trees [*R.A.M.*, 33, p. 439; 34, p. 157] damaged by geese in a Gloucestershire nursery. Only trees with a diameter of about ½ in. were damaged. The protection of each tree by a wire-netting collar is recommended.

Goodman (R. N.). **Antibiotics for control of fireblight.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 186–190, 1954.

At the University of Missouri, Columbia, *in vitro* experiments showed that the agent of apple fireblight, *Erwinia amylovora* [*R.A.M.*, 34, p. 529], was inhibited by

terramycin at 2·5 p.p.m., streptomycin at 50 p.p.m., and thiolutin at less than 100 p.p.m. In the greenhouse, foliar sprays, containing 250 p.p.m. each of streptomycin and terramycin plus methyl cellosolve and carbowax 4000 as penetrants, both at one per cent., applied to inoculated one-year-old potted Jonathan apple trees, effectively controlled fireblight.

New Iowa Apple resists blight.—*Iowa Fm Sci.*, 8, 5, pp. 10-330–11-331, 1953.

In the varietal trials for apple resistance to fireblight [*Erwinia amylovora*: *R.A.M.*, 33, p. 157], which was very severe during the past three years in Iowa, a cross between McIntosh and Longfield, Sharon, developed at the Iowa Experiment Station in 1922, was free from infection and set a good crop when Jonathan failed. Delicious was almost free from blight at blossom-time and twig damage was only sporadic during the growing season. A cross between Jonathan and Delicious has recently been developed by the Experiment Station and shows marked resistance to fireblight.

Shannon (L. M.). **Internal bark necrosis of the Delicious Apple.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 165–174, 2 figs., 1 diag., 3 graphs, 1954. [Received June, 1955.]

An experiment was initiated at Rutgers University, New Brunswick, New Jersey, to investigate the physiological factors which have been reported to cause internal bark necrosis of Delicious apples [*R.A.M.*, 29, p. 33]. The symptoms were induced in Delicious scions on Malling VII rootstocks in sand cultures by excess manganese (over 50 p.p.m.), or no boron, or excess iron (over 50 p.p.m.), decreasing in severity in that order. Histological examination of affected tissue revealed that the internal bark necroses caused by the three sets of conditions were basically similar; necrotic areas originating in the cortex and phloem became surrounded by a cork cambium and were visible externally as elevations in the epidermis followed by small irregular lesions in the bark.

Matlock (D. L.) & Childers (N. F.). **Investigations of an Apple leaf chlorosis.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 52–60, 1 fig., 1954. [Received June, 1955.]

At Freehold, New Jersey, a group of apple trees has exhibited since 1950 chlorosis and premature leaf drop, resembling that associated with manganese deficiency. The leaves were deficient in manganese. Single and combined sprays and leaf dips of magnesium, manganese, borax, zinc, and urea had no effect on the disorder. Lettuce grown on the same soil showed a marked response to lime. The low vigour and chlorosis of the apple trees may be attributed to poor root development in association with poor absorption of certain nutrients under acid soil conditions.

Tukey (R. B.), Klackle (R. L.), & McClintock (J. A.). **Observations on the uncongeniality between some scion varieties and Virginia Crab stocks.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 151–155, 1954. [Received June, 1955.]

The symptoms of an uncongeniality between Virginia Crab apple stocks and some apple varieties such as Blaxtaman, Turley, Golden Delicious, Blackjon, Starking, and Richared Delicious include dwarfing, low vigour, downward growth habit, precocious bearing, and small fruit. In the stock the uncongeniality is expressed as irregular growth rings and pitting of the xylem. It is suggested that these symptoms may be expressions of a latent apple virus which becomes evident when the infected varieties are grafted on Virginia Crab, in which case this stock may serve as a useful indicator plant.

Bould (C.). **The use of iron chelates for the control of lime-induced chlorosis in fruit : progress report I.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 91–95, 1 pl., [1954].

The results of preliminary field experiments at Long Ashton Research Station, Bristol, on the control of lime-induced chlorosis in red currant, plum, and pear [*R.A.M.*, 34, p. 231] indicated that soil treatment with ferric disodium ethylene diaminetetraacetate (Fe-EDTA) was less effective under alkaline than under acid conditions; injections with the same compound were less effective than with ferrous sulphate at an equivalent iron concentration. Foliage sprays at concentrations above 0·1 per cent. caused damage.

Johnson (F.), Allmendinger (D. F.), Miller (V. L.), & Pulley (Dorothy). **Fall application of boron sprays as a control for blossom blast and twig dieback of Pears.**—*Phytopathology*, 45, 2, pp. 110–114, 2 figs., 1955.

For upwards of 25 years pear trees, chiefly of the Bartlett, Anjou, and Bosc varieties, in south-western Washington have been affected by a blossom blast and twig die-back. The flowers begin to shrivel and die soon after full bloom, the distal tips of the current season's shoots are abscissed, and on the rest of the spur two or more laterals develop, producing a short, compact, stubby growth. Foliar development is retarded and in severe cases the young leaves are shed, causing a die-back of the terminal branches.

The disorder was found to be due to boron deficiency [*R.A.M.*, 22, p. 213] and proved to be completely controllable in five orchards by spraying in the autumn with borax 3 in 100 or polybor 1 and 2 in 100. Chemical analyses of samples from four orchards at four times during the growing season revealed a uniformly higher boron content in the bud clusters, leaves, and fruit of treated trees than in those of the unsprayed, the amounts in the healthy untreated samples being intermediate.

Savage (C. R.) & Cowart (F. F.). **Factors affecting Peach tree longevity in Georgia.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 81–86, 1954. [Received June, 1955.]

As a result of field studies at Experiment, Georgia, on the survival of peach trees replanted on old peach orchard land it is concluded that root rot due to *Clitocybe tabescens* [*R.A.M.*, 33, p. 434], although causing heavy losses, is not the only factor responsible for the widespread failure of replanted peaches. The problem is not associated with toxins remaining in the soil from old peach roots, or from accumulated pesticides, but may well be approached by a study of the microflora and physical properties of old orchard soils.

McClung (A. C.). **The occurrence and correction of zinc deficiency in North Carolina Peach orchards.** *Proc. Amer. Soc. hort. Sci.*, 64, pp. 75–80, 1 fig., 1954. [Received June, 1955.]

In a survey of North Carolina peach orchards the mean zinc content of leaves from orchards with chlorosis was 10·3 p.p.m. compared with 19·2 p.p.m. in normal leaves. The deficiency increased with a corresponding reduction in the use of zinc-containing insecticides. The application of foliar sprays (0·15 and 0·3 lb. zinc sulphate for young and old trees, respectively) was the most effective method of correcting the chlorosis [cf. *R.A.M.*, 33, p. 37].

Jordović (M.). **Osetljivost plodova nekih sorata Bresaka prema parazitu Monilia sp.** [Fruit susceptibility of some Peach varieties to the parasite *Monilia* sp.]—*Arh. poljopr. Nauk* [*Trans. Inst. Agron. Res.*], 7, 17, pp. 96–99, 1954. [English summary. Received 1955.]

At the Institute for Fruit Cultivation, Čačak, Yugoslavia, none of the ten peach

varieties tested for reaction to brown rot (*Monilia* sp.) [*Sclerotinia fructigena* or *S. laxa*: C.M.I. maps Nos. 22, 44] by inoculation of the fruits was completely resistant. Red Bird and Elberta showed the highest resistance of mature fruit. Susceptibility was found to increase with maturity, hence early harvest, before the fruit is quite ripe, is advisable.

Gavrilović (M.). **Apopleksija Kajsija i mere za njeno otklanjanje.** [Apoplexy of Apricots and measures for its elimination.]—*Arh. poljopr. Nauk* [*Trans. Inst. Agron. Res.*], 6, 13–14, pp. 137–148, 4 figs., 1953. [French summary.]

Apricot apoplexy [cf. *R.A.M.*, 33, p. 488] is believed to be responsible for premature wilting of apricot trees in Yugoslavia from 1949 to 1953. The disease often follows frost injury and may be caused by the osmotic difference between the root stock and the scion. The plum varieties Belošliva, Petrovača, and Ilinjača are suitable root-stocks, trees on these varieties being particularly long-lived. Early maturity of apricot trees, achieved by proper selection of planting sites and soil and by the use of potassium and phosphate fertilizers where necessary, is important if frost injury is to be avoided.

Corke (A. T. K.). **Blackcurrant leaf spot : I. Studies of perennation and infection.**—*Rep. agric. hort. Res. Sta. Bristol. 1953*, pp. 154–158, 1 graph. [1954].

Investigations on the life history of *Pseudopeziza ribis* on the Baldwin blackcurrant variety [*R.A.M.*, 29, p. 32] at Long Ashton Research Station, Bristol, in 1953, confirmed that the fungus overwinters in the perfect state on dead leaves. In the laboratory inoculations with ascospores and conidia showed that individual lesions have little effect on the leaves, damage in the field being attributed to the mass infections following summer rainstorms. Primary infections occurred mostly in May on the leaves surrounding the fruit-clusters. Incidence throughout the summer was reduced significantly by the removal in February of dead leaves from the ground around the bushes. Similar results, but less effective, were obtained with a ground spray of 0·1 per cent. dinitro-*o*-cresol [DNC] in 2 per cent. oil emulsion during February and with a routine application of 1·5 per cent. lime-sulphur in April.

Strawberries.—*Bull. Minist. Agric., Lond.*, 95, 44 pp., 8 pl., 1 diag., 1955. 2*s.* 6*d.*

In the fifth edition of this bulletin on all the aspects of strawberry cultivation, first published in 1937, the revised section on pest and disease control (pp. 32–40) includes notes on the symptoms, varietal reaction, and control of the strawberry viruses yellow edge [*R.A.M.*, 28, p. 341], severe crinkle [32, p. 262], and green petal [33, p. 96]; and the fungus diseases caused by *Sphaerotheca humuli* [24, p. 156], *Botrytis cinerea* [33, p. 737], *Phytophthora fragariae* [34, p. 42], and *Verticillium* wilt [31, p. 69]. This is followed by a short section dealing with spraying and dusting machinery suitable for use on strawberry crops. In an appendix the Ministry of Agriculture certification scheme for issuing special stock (S.S.) and ordinary (A) certificates to selected parent stocks grown under approved conditions is outlined. Appendix II describes the nuclear stock scheme operated independently by the Nuclear Stock Association for the production of foundation stock in England and Wales.

Williams (H.). **June yellows : a genetic disease of the Strawberry.**—*J. Genet.*, 53, 2, pp. 232–243, 2 graphs, 1955.

Inheritance studies at the John Innes Horticultural Institution, Bayfordbury, Herts., confirmed the view that the June yellows of strawberries [*R.A.M.*, 31, p. 558] is a spontaneous genetic variegation confined to certain clones [cf. 32, p. 684]. The variation in the severity of the variegation of a plant is apparently followed by variation in the transmission of variegation to seedlings. It is suggested that the

disorder may be caused by a high concentration of a rogue plasmagene or a low concentration of a normal plasmagene necessary for chlorophyll production. The only certain method of control is the cultivation of non-susceptible varieties. In susceptible plants, such as Blakemore, partial control may be obtained by selecting stock with a low incidence.

Zabłocka (Wanda). **Maślanka wiązkowa-Naematoloma (Hypholoma) fasciculare (Fries ex Huds.) Karst. jako pasożyt roślin uprawnych.** [Butter-milk tuft—*Naematoloma* (*Hypholoma*) *fasciculare* (Fries ex Huds.) Karst. as a parasite of cultivated plants.]—*Acta Soc. Bot. Polon.*, 22. 4. pp. 829–837, 4 figs., 1953. [English summary.]

Hypholoma fasciculare was responsible for the destruction of strawberry plants growing on the site of an old apple orchard in Poland, in spite of soil and climatic conditions favourable to the plants.

Cain (J. C.). **Blueberry chlorosis in relation to leaf pH and mineral composition.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 61–70, 2 figs., 1 graph, 1954. [Received June, 1955.]

In this preliminary investigation at New York Agricultural Experiment Station, Geneva, of chlorosis of blueberry [*Vaccinium* spp.] due to iron deficiency [*R.A.M.*, 31, p. 25] it was shown that the symptoms produced by accumulated basic cations (calcium, magnesium, and potassium) in the presence of increasing pH, by iron deficiency, by growth on calcareous soils, and by cobalt toxicity are visually identical. The *Vaccinium* chlorosis observed on highland soils suitable for other crops is possibly due to an unfavourable soil pH for iron utilization and the presence of some heavy metals.

Ciferri (R.), Baldacci (E.), Rui (D.), Scaramuzzi (G.), Fogliani (G.), & Rostirolla (G.). **Anomalie fogliari dell'Olivo ligure e gardesano.** [Leaf malformations of the Olive tree in Liguria and Garda.]—*Ann. Sper. agr.*, N.S., 7, 6, pp. 1957–1976, 12 figs., 1953. [English summary.]

A study is presented of leaf malformations observed on olive trees growing in Liguria and in the vicinity of Lake Garda, Italy [*R.A.M.*, 32, p. 259]. Macrophylly, microphylly, symmetrical or asymmetrical chorisis, lobing, and modifications of shape or margin were frequently associated with phloem necrosis (leptonecrosis) [31, p. 246; 34, p. 466] in the same tree or orchard. Similar symptoms may also be seen on olive trees in Morocco and Macedonia (*Kew Bull.*, 3, pp. 437–442, 1951). Sickle-leaf, also reported from California (by H. E. Thomas *in litt.*), is much more prevalent than leptonecrosis, and is not, apparently, associated with it, though trees affected by the latter condition frequently bear sickle-shaped leaves.

Greenway (P. J.), Wallace (G. B.), Wallace (M[aud] M.), & Khomo (E. V. R.). **The Papaw, its botany, cultivation, diseases, and chemistry.**—*Pamphl. Dep. Agric. Tanganyika* 52, 32 pp., 6 pl., 2 figs., 1953.

The section of this pamphlet dealing with diseases of the papaw in East Africa and their control (pp. 19–27) is substantially the same as a previous article which has already been noticed [*R.A.M.*, 27, p. 483]. Potentially the most serious disease is mosaic [cf. next abstract], but this has so far only been observed infrequently in Tanganyika.

Chateau (R.). **Pathologie du Papayer.** [The pathology of the Papaw.]—*Fruits & Primeurs*, 23, 248, pp. 273–277, 4 figs., 1953.

Brief, practical notes based on the relevant literature (25 references) are given on the geographical distribution, symptoms, transmission, and control of the chief virus and fungal diseases of papaws. Bunchy top viruses [*R.A.M.*, 32, p. 575]

occur in Puerto Rico, Hawaii, Trinidad, Jamaica, and Cuba. Ring spot virus appears to be confined to Hawaii [28, p. 468]. Die-back [? virus] appears to be less common than bunchy top or ring spot. Yellow crinkle virus [29, p. 316] is present in Queensland, India, and Oceania, and a virus was responsible for a mosaic disease of papaw in Bombay [28, p. 131 and cf. preceding abstract].

Fungal diseases dealt with include affections of the roots, trunk, leaves, and fruit. The roots and base of the trunk are attacked by *Pythium butleri*, *P. aphanidermatum*, *P. ultimum*, and *P. complectens*, which often cause seedling damping-off or leaf withering in fully-grown plants. They have caused serious root infection in Queensland, South Africa, Peru, French Equatorial Africa, and India. *Phytophthora cinnamomi* [31, p. 25; 32, p. 592], *P. parasitica* [27, p. 483 *et passim*], and *P. palmivora* [30, p. 446] occur in various tropical areas. In the Cameroons a collar rot is caused by *Fusarium solani* var. *minus* [29, p. 470]. Target spot (*Mycosphaerella* sp.) [26, p. 147] occurs in Florida; another form of leaf spot is caused by *Asperisporium caricae* [27, p. 100]. Papaw fruits are affected by anthracnose (*Colletotrichum* ? *gloeosporioides*) [33, p. 164], which causes severe losses, especially in Hawaii and western parts of Africa; *Ascochyta caricae*; *Sphaerotheca* sp., causing powdery mildew, sometimes associated with *Gloeosporium* sp., *A. caricae*, and *Phomopsis papayae*; *Rhizopus nigricans*; *Pucciniopsis caricae* [26, p. 114]; *Oidium* sp.; *Rhizoctonia* sp.; and *Lasidiodiplodia* [*Botryodiplodia*] *theobromae* [15, p. 344].

Woodcock (D.). **The effect of chemical structure on biological activity: the significance of chlorine in certain insecticides, fungicides and plant growth-regulators.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 96–101, [1954].

The information on the significance of chlorine in protective and systemic fungicides has already been noticed from other sources [*R.A.M.*, 33, pp. 101, 543].

Horber (E.). **Gefahren und Vorsichtsmaßnahmen bei der Anwendung von Pflanzenschutzmitteln im Feldbau.** [Dangers and precautionary measures in the application of plant protectives in agriculture.] *-Mitt. schweiz. Landw.*, 3, 4, pp. 49–57, 1955.

The rapidly expanding application of an increasing variety of plant protectives in Swiss agriculture calls for a clear understanding on the part of consumers of the risks inherent in this practice to the health of operators, livestock, and useful plants. Information is accordingly supplied, *inter alia*, on the toxicity of the preparations concerned (including among fungicides dinitrocresol, fluorsilicates, formalin, and copper and mercury compounds), the nature of the injuries that may be caused, and the precautionary measures to be adopted.

Ciferri (R.). **Revisione dei metodi di controllo biologico proposti per gli anticrittogamici e metodi addottati in Italia.** [Review of the methods of biological testing proposed for fungicides and the methods adopted in Italy.]—*Atti Ist. bot. Univ. Pavia*, Ser. 5, 10, 1, pp. 3–23, 1953. [French, English, and German summaries. Received October, 1954.]

This review of the methods used for the biological testing of fungicides in Italy and elsewhere is a reprint, with a few additions and corrections, of an earlier paper by the same author [*R.A.M.*, 29, p. 108].

Specialpræparater anerkendte af Statens Forsøgsvirkomhed i Plantekultur til bekæmpelse af plantesygdomme og skadedyr. Gyldig for året 1955. [Special preparations approved by the State Experimental Service for the control of plant diseases and pests. Valid for the year 1955.]—*Tidsskr. Planteavl*, 58, 5, pp. 871–912, 1955.

The fungicides and insecticides officially approved for use in Denmark in 1955

[cf. *R.A.M.*, 34, p. 164] are listed with analyses of their composition, addresses of the manufacturers, and other relevant information.

Beaumont (A.). **Soil-borne diseases and crop rotation.**—*N.A.A.S. quart. Rev.*, 1953, 23, pp. 108–111, 1954.

The author discusses the efficacy of crop rotation in controlling soil-borne diseases, including [potato] wart disease [*Synchytrium endobioticum*: cf. *R.A.M.*, 33, p. 686], turnip club root [*Plasmodiophora brassicae*], clover rot [*Sclerotinia trifoliorum*], onion downy mildew [*Peronospora destructor*], take-all (*Ophiobolus graminis*) [33, p. 408] and eyespot [*Cercosporella herpotrichoides*: loc. cit.] of wheat and barley, and tulip fire [*Botrytis tulipae*], with special reference to some standard rotations. The importance of proper cultivation is stressed.

Crop varieties recommended for Ohio in 1955.—*Fm Home Res.*, 39, 291, pp. 85–90, 1 map, 1954.

An annotated list is given of cereal, soybean, lucerne, red clover, and grass varieties recommended by Ohio Agricultural Experiment Station and Agricultural Extension Service for cultivation in Ohio in 1955. Among the varieties noted are Butler wheat, resistant to all races of loose smut [*Ustilago tritici*: *R.A.M.*, 33, p. 473], and the maize varieties Indiana 750 B and Ohio W 10, both showing good resistance to leaf blight [*Helminthosporium turcicum*: 32, p. 178] and the latter also to smut [*U. maydis*: 32, p. 177].

Disease resistance is regarded as the most important factor in choosing lucerne and red clover varieties, particularly resistance to bacterial wilt [*Corynebacterium insidiosum*] in the former. Varieties of lucerne possessing this character are Ranger and Buffalo.

Dring (D. M.). **A periodic acid-Schiff technique for staining fungi in higher plants.**—*New Phytol.*, 54, 2, pp. 277–279, 1955.

In the course of work on *Mycosphaerella brassicicola* in the Department of Botany, University College, Exeter, it was necessary to differentiate between the hyphal walls of the fungus and the host cells. Kligman & Mescon's periodic acid-Schiff technique (*J. Bact.*, 60, pp. 415–421, 1950) was tested. By strictly limiting the time of immersion of the preparations in periodic acid the fungus walls were oxidized sufficiently to permit them to stain strongly while leaving the cellulose relatively unoxidized and therefore unstained. Good results were obtained by the following procedure. Material was fixed in Navashin or formalin acetic acid, sectioned, and immersed in 1 per cent. w/v aqueous periodic acid solution for two to five minutes (not exceeding three if the tissue was to be counter-stained), washed in running tap water for ten minutes, placed in Schiff's reagent (leuco-fuchsin) for five minutes, given at least two changes of 10 per cent. potassium metabisulphite in normal hydrochloric acid (1:1) in 90 ml. water, washed again for ten minutes, dehydrated, cleared, and mounted. Carbohydrates were stained magenta by the reagent, while with counterstaining the fungus turned magenta to purple and the host tissue green.

Promising results were obtained with several rusts, anemone mycorrhiza, and certain wood-destroying fungi as well as *M. brassicicola*.

Ahmad (M.), Chaudhury (A. R.), & Ahmad (K. U.). **Studies on toddy yeast.**—*Mycologia*, 46, 6, pp. 708–720, 3 figs., 1954.

A study carried out at the Department of Botany, University of Dacca, Pakistan, on 15 yeast cultures isolated from the toddy obtained from the Palmyra palm (*Borassus flabellifer*) is described.

Hacskaylo (J.), Lilly (V. G.), & Barnett (H. L.). **Growth of fungi on three sources of nitrogen.**—*Mycologia*, 46, 6, pp. 691–701, 1954.

In a study carried out at the Department of Plant Pathology, Bacteriology, and Entomology, West Virginia University, the relative rate and amount of growth of 25 species of fungi including *Alternaria solani*, *Chaetomium globosum*, *Helminthosporium gramineum*, *Sclerotinia minor*, *Trichoderma lignorum* [*T. viride*], *Verticillium albo-atrum*, *Daedalea quercina*, *Fomes subrosea*, *Ganoderma lucidum*, *Lenzites sepiaria*, *Schizophyllum commune*, *L. trabea*, and *Polyporus* [*Polystictus*] *versicolor* were determined when the organisms were supplied with an equivalent amount of nitrogen in different forms [cf. *R.A.M.*, 32, p. 272].

All the species utilized asparagine and ammonium nitrogen, but the amount of growth with the latter was limited in most when ammonium sulphate was used, probably because of the low pH. The basidiomycetes grew very slowly with nitrate and appeared to be able to utilize it very slowly. The amount of growth of most of the species on the ammonium medium unsupplemented with fumaric acid was less than with asparagine. The value of ammonium sulphate for most of the species was greatly increased by fumaric acid (fumarate). It had small effect on the rate and amount of growth when nitrate nitrogen was used, but its addition maintained the pH values at higher levels and made ammonium sulphate about equivalent in value to the more expensive L-asparagine as a nitrogen source. In experiments of brief duration, many of the species tested utilized nitrogen slowly or not at all, though they may do so in more protracted ones. Where many species of unknown nutritional requirements are to be grown nitrates should be considered a poor source of nitrogen. The evidence obtained suggests that a latent ability to utilize nitrate nitrogen may readily be overlooked when short incubation periods are used.

Mix (A. J.). **Differentiation of species of Taphrina in culture. Utilization of carbon compounds.**—*Mycologia*, 46, 6, pp. 721–727, 1954.

In further studies at the Department of Botany, University of Kansas, 74 isolates of *Taphrina* [*R.A.M.*, 33, p. 384], representing 26 species and 55 host-forms, were grown in mineral solution with 32 different carbon compounds. All were able to utilize a number of carbohydrates. Different host-forms of *T. deformans* from peach and plum and of *T. ulmi* [cf. 25, p. 539] from elms (*Ulmus alata* and *U. rubra*) agreed as to the carbon compounds utilized. Other host-forms differed from each other in this respect. There was, however, some approach to agreement between different forms of *T. communis* [cf. 18, p. 414] from six different species of *Prunus*, as there was, also, between the fungi from *Populus* spp., *T. johansonii* [16, p. 642], *T. populina*, and *T. populi-salicis* [28, p. 548]. It would appear possible from these data that the feature of carbon utilization may serve as a basis for characterization of these fungi, each species exhibiting an individual pattern.

Chilton (J. E.). **Volutella species on Alfalfa.**—*Mycologia*, 46, 6, pp. 800–809, 8 figs., 1954.

Comparative studies were carried out at the Department of Botany and Plant Pathology, Iowa State College, on three species of *Volutella* found on forage legumes locally, *V. gilva* and *V. ciliata* [*R.A.M.*, 34, p. 372], with bright, superficial sporodochia, and one not previously named [loc. cit.], *V. colletotrichoides* n.sp. The variant producing densely setose sporodochia [loc. cit.] is referred to *V. c.* var. *setosa* n.var.

Three replicated experiments carried out mainly on potted lucerne and red clover plants and involving soil and seed inoculations with *V. colletotrichoides* produced no root infections, though girdling of young lucerne seedlings by linear, water-soaked, stem lesions resulted to a limited extent. Laboratory experiments in which conidial suspensions were added to sterilized sand in deep Petri plates before sowing

with disinfected red clover seed gave similar stem infections, from which the fungus was recovered. Spray inoculations of seedlings gave a low but consistent rate of infection. Common symptoms on lucerne and red clover were water-soaking at some point on the petiole, elongate lesions, and girdling; these usually occurred five to ten days after inoculation.

Inoculations of mature lucerne and red clover plants produced girdling of the petiole and stem tips, which imparted a blighted appearance to severely infected plants. Infection of mature stem tissues produced elliptical, sunken lesions to a limited extent. There was no evidence of systemic invasion, though under high moisture conditions stem infections gradually enlarged and involved much of the plant. Leaf-spotting was not a consistent or definable symptom.

V. colletotrichoides was also isolated from *Lotus corniculatus* in the field. Greenhouse inoculation established infection on alsike clover and *Medicago falcata*. *Melilotus alba* and soybean were not infected. The most susceptible plant appeared to be common lucerne. As inoculation experiments gave a very low incidence of infection and no spread or increase in the field was observed during a period of two years, the fungus does not seem likely to become of economic importance.

CORBETT (M. K.). **Apparent hypersensitivity of Potato hybrids to Potato virus Y.**—*Phytopathology*, 45, 3, pp. 148–155, 1955.

At the Department of Plant Pathology, Cornell University, Ithaca, New York, potato seedlings that reacted to mechanical inoculation with potato virus Y by the development of local necrotic lesions [cf. *R.A.M.*, 25, p. 229; 27, p. 332] were easily obtained from the inbred progenies of the Ashworth, Fillmore, Glenmeer, Katahdin, Placid, and Virgil varieties. Such hypersensitive seedlings contracted systemic infection on exposure to aphid (*Myzus persicae*) infestation in the field or when inoculated at a very juvenile stage (three to seven days), or near the growing tips at a fortnight old. The inoculation of older leaves, either mechanically or by means of aphids, resulted exclusively in localized infection. Abscission was retarded by treatment of the petioles of inoculated leaves with indoleacetic acid in lanolin, the virus moved out of the foliage, and systemic infection developed.

The results of these experiments are considered to show that the response of potato clones to mechanical inoculation of the older leaves with virus Y is not indicative of their reaction to field infection, which may be more reliably predicted by inoculation of very young plants or of the growing tip of older ones.

WRIGHT (N. S.). **The witches' broom virus disease of Potatoes.**—*Amer. Potato J.*, 31, 6, pp. 159–164, 7 figs., 1954.

Witches' broom virus of potato became economically important in British Columbia [*R.A.M.*, 33, p. 751] about 1940, with the expansion of the seed potato industry into the north-central districts of the province, where the virus is now the most prevalent of those affecting potato. While the usual incidence does not exceed 2 per cent., in 1941 and 1947 up to 15 per cent. of plants in one field were diseased following the hot, dry summers of 1940 and 1946.

Occasional minor variations occur in the degree of chlorosis, extent of leaf rolling, and rate of development of infection in potato. In addition to the two strains already described [32, p. 334] a third type was distinguished on Bonny Best tomato and *Cyphomandra betacea*, the symptoms on tomato differing from those of tomato big bud [loc. cit.] in the more intense chlorosis and greater reduction in size of the leaves, and in normal flower development, and on *C. betacea* in the reduced size of the leaves.

White Rose potato plants inoculated with witches' broom virus in 1949 and propagated by tubers in subsequent years showed signs of recovery in 1952, and by 1953 the percentages of plants with typical brooms and with partially recovered

and normal foliage were 11, 64, and 25, respectively. Tuber size had no effect on symptoms. All plants, with and without symptoms, produced an unusually large number of tubers, though those with recovered foliage had fewer and larger ones than those with brooms.

Mastenbroek (C.) & de Bruin (T.). **Het voorkomen van physio 4 van Phytophthora infestans in Nederland.** [The occurrence of physiologic race 4 of *Phytophthora infestans* in Holland.]—*Tijdschr. PlZiekt.*, 61, 3, pp. 88–92, 1955. [English summary.]

In experimental plots at the Breeding Station Central Bureau, Hoofddorp, Holland, a shift in the distribution of physiologic races of *Phytophthora infestans* [*R.A.M.*, 34, p. 393] was observed between 1951 and 1954. Thus, in 1951 race 0 constituted 20 of the total of 28 isolates and in 1952 it comprised 22 out of 85; in the two following years it was entirely absent. Race 4 [34, p. 315], isolated only twice in 1951, was represented in 59 collections in 1952, while in 1953 and 1954 it occurred alone in four out of 13 and 15 out of 16, respectively. In 1951 race 4 was associated once with race 2, once with 1 and 2, and twice with 2 and 3; in 1952 once with 2 and once with 1 and 2; in 1953 nine times with 2 and 3; and in 1954 once with 1. Race 4 was also isolated from material submitted from Sweden, Denmark, Switzerland, Portugal, and Jordan, and its presence in Canada has been reported by Graham (abs. in *Phytopathology*, 44, p. 490, 1954). Varieties yielding race 4 in different parts of Holland in 1953 and 1954 were Eersteling [Duke of York], Bintje, Meerlander, Eigenheimer, Wilpo, Schoolmeester, and Libertas. The recent predominance of race 4 is tentatively attributed to an increase in aggressiveness.

Akeley (R. V.) & Buck (R. W.). **Breeding for resistance to late blight.**—*Amer. Potato J.*, 31, 6, pp. 165–172, 1954.

The authors survey the work done since 1932 by the United States Department for Agriculture in co-operation with the Maine Agricultural Experiment Station on breeding potato varieties resistant to late blight (*Phytophthora infestans*). Most of the information has been noticed from time to time in this *Review* [*R.A.M.*, 25, p. 313; 27, p. 34; 28, p. 139; 32, p. 207; 33, p. 592].

Cass Smith (W. P.), Hardie (M.), & Lowe (B. N.). **Plant diseases. Further experiments on the control of early blight or target spot of Potatoes.**—*J. Agric. W. Aust.*, Ser. 3, 3, 1, pp. 59–60, 63–64, 2 figs., 1954.

In 1953, summer-crop potatoes growing in Western Australia and sprayed against *Alternaria solani* [*R.A.M.*, 33, pp. 468, 645] with dithane Z-78 (2 lb. per 100 gals.) on 25th March and 2nd, 13th, and 23rd April averaged 63·8 lb. of first grade tubers per plot, as compared with 51·3 lb. for a plot given four applications of copper oxychloride, and 49·8 lb. for the unsprayed.

On the assumption that dithane Z-78 will shortly be commercially available in Western Australia at about 15*s.* per lb., it is tentatively recommended that the first application at a minimum of 200 gals. per acre should be made while the disease is present in trace amounts only and before the tops in adjacent rows meet, thorough coverage being essential. A second spray of 300 gals. per acre should be applied 10 to 14 days later.

Jones (W.). **Pink rot of Potato tubers on Vancouver Island.**—*Canad. J. agric. Sci.*, 34, 5, pp. 504–506, 1 pl., 1954.

Pink rot of potato caused by *Phytophthora erythroseptica* [*R.A.M.*, 25, p. 8], not previously reported from the coastal areas of British Columbia [cf. 29, p. 113], was present in August, 1953, in a garden near Victoria. The fungus may have been introduced into the garden, situated on high land with well-drained soil, in seepage

from a neighbouring septic tank. Spinach and tomato seedlings succumbed to soil inoculation, and these species should be avoided in crop rotations where the disease has been present. Cabbage, turnip, radish, maize, pea, and garden beet were not attacked. For control good soil drainage is very important; overhead irrigation is not recommended late in the season when the tubers are maturing, or during autumn rains.

Whiteman (T. M.) & Lutz (J. M.). **Sunken scald spot field injury evident in stored Potatoes.**—*Amer. Potato J.*, 31, 2, pp. 43–49, 1 fig., 1954.

In order to evaluate the relative importance of the factors causing sunken scald spot, or wind injury, of potatoes, Triumph tubers in the Red River Valley area, North Dakota, were exposed in the field in canvas and burlap bags of different weights for varying periods (mostly one to four hours) immediately after picking and prior to storage. Damage was assessed after storage, in late March.

Sunken scald spot is most common on early crop potatoes, and develops chiefly on scarified areas which fail to heal properly when exposed to drying winds at harvest. Tubers exposed for four hours in 10 oz. canvas bags were much less severely affected than those in 8, 10, or 12 oz. burlap bags, which showed extensive injuries, often followed by bacterial decay. There was little sunken scald spot in potatoes not exposed in the field.

Coles (G. V.) & Byrde (R. J. W.). **The fungicidal properties of coal-tar distillates : progress report.**—*Rep. agric. hort. Res. Sta. Bristol, 1953*, pp. 109–120, 7 graphs, [1954].

In this progress report on laboratory investigations at Long Ashton Research Station, Bristol, it is stated that the maximum fungicidal efficiency of fractions of coal tar distillates against an isolate of *Ceratostomella* [*Ceratocystis*] *fimbriata* from rubber in Malaya [*R.A.M.*, 34, pp. 396, 545] was associated with the high-boiling tar acids, which resulted in 53 per cent. inhibition at 100 p.p.m. on agar. The fungicidal value of well-fractioned neutral tar oils (principally the acenaphthene fraction) increased significantly as the carbonization methods became more severe and the oils more aromatic.

A close correlation was established between the laboratory results and those obtained in Malayan plantation trials at the Rubber Research Institute.

Lobb (W. R.). **Sulphur investigations in North Otago.**—*N.Z. J. Agric.*, 89, 5, pp. 434–438, 9 figs., 1954.

In fertilizer trials with sulphur [cf. *R.A.M.*, 33, p. 380; 34, p. 372] started in 1952 in North Otago, New Zealand, on fertile soils producing good crops, big increases in growth of legumes were obtained on pastures in six places (from Tokarahi to Kakanui on the coast), following sulphur or thiosulphates. Sulphur deficiency is indicated by a general yellowing with reduced growth and number of nodules, and was observed in red and white clovers. French beans [*Phaseolus vulgaris*], rape, soft turnip, and chou moellier [marrow-stem kale], symptoms in the last three being characterized by interveinal yellowing and the development of bronze, purplish, or red leaf colours.

Responses were obtained from red and white clovers (to applications of 28 lb. sulphur or 2 cwt. superphosphate per acre), French bean, and rape (28 lb. sulphur). Similar results may be expected from turnips and marrow-stem kale. The exact rate of sulphur application has not yet been determined but the optimum amount appears to be between 20 lb. (contained in 2 cwt. of superphosphate) and 28 lb. On certain soils, however, even 10 to 20 lb. may give good responses, while 28 lb. elemental sulphur is reported to have a marked residual effect.

Where sulphur alone is deficient cheaper forms of sulphur than superphosphate

are recommended, the latter to be given only when both sulphur and phosphate are required.

Newhall (A. G.). **Disinfestation of soil by heat, flooding and fumigation.**—*Bot. Rev.*, **21**, 4, pp. 189–250, 1955.

This is a general survey of soil disinfection methods and the changes they induce in the soil. It is based on a bibliography of approximately 380 titles.

News and notes. II. Marble disease kills Cardamom.—*Indian For.*, 81, 6, p. 389, 1955.

The marble or katte disease [? mosaic: *R.A.M.*, **25**, p. 10] of cardamom is reported to be very destructive in New Delhi.

Eradication of the disease by the destruction of all old and diseased plants and the use of only healthy seedlings grown under disease-free conditions is recommended. Full co-operation by all the farmers is necessary.

Lozada (T.). **El mosaico en la Caña de Azúcar.** [Mosaic in Sugar-Cane.]—*Agricultor venezol.*, **19**, 175, pp. 21–23, 2 figs., 1955.

Essential information on the history, symptoms, economic importance, mode of transmission, and control (by the use of resistant varieties) of sugar-cane mosaic is presented. The ruinous position of the sugar-cane industry in Venezuela [*R.A.M.*, **29**, p. 479] is attributed in large part to the cultivation until a short time ago of the susceptible BH 10 (12) variety instead of the resistant P.O.J., P.R., M., and others recommended by the Ministry of Agriculture and Stock.

Dias (Maria R. de S.) & da Camara (E. de S.). **Fungi Lusitaniae VII.** [Fungi of Portugal VII.]—*Agron. lusit.*, **16**, 1, pp. 5–15, 3 pl., 1954.

This further contribution to the current series of critically annotated records of Portuguese fungi [cf. *R.A.M.*, **33**, p. 504 and next abstract] comprises, *inter alia*, a new genus, 10 new species, and a new variety. The black, globose perithecia of *Leptosphaeria aloes* n.sp., collected on the foliage of *Aloe arborescens*, measure 170 to 290 by 150 to 220 μ; the cylindrical, very shortly stipitate or sessile, hyaline asci, 72·5 to 85 by 9·75 to 13 μ, each contain eight cylindrical, mostly quinqueseptate, yellowish spores, 23·75 to 30 by 6·25 to 7 μ; and there are numerous filiform, hyaline paraphyses, projecting above the asci.

Dothiorella strobilomorphospora n.sp., occurring on black mulberry branches in conjunction with *Coniothyrium foedans* and *Botryodiplodina mori* n.g., n.sp., is characterized by innate, erumpent, caespitose, globose or ellipsoid, black pycnidia, 250 to 400 by 250 to 280 μ; cylindrical, fasciculate, hyaline conidiophores, 5·5 to 10·5 by 2 μ; and obclavate, continuous, hyaline conidia, 22·5 to 26 by 5 to 6 μ. The immersed, orbicular or subglobose, brown pycnidia of *B. mori* measure 180 to 220 by 160 to 200 μ, and the ellipsoid to oblong, uni- or very rarely biseptate, mostly straight, yellowish-green conidia 7 to 12·5 by 2·5 to 3·75 μ.

Botryodiplodia celtidis n.sp., found on *Celtis occidentalis* twigs, forms ellipsoid, black pycnidia, 140 to 300 by 80 to 140 μ, and cylindrical, straight, uniseptate, hyaline, later black to brown conidia, 19·5 to 25·5 by 10 to 12·5 μ. The subepidermal, pluriloculate, more or less ellipsoid or rotund, black pycnidia of *B. pistaciae* n.sp., collected on twigs of *Pistacia lentiscus*, measure 200 to 450 by 180 to 260 μ; the cylindrical, fasciculate, hyaline conidiophores do not exceed 5·2 μ in length; and the ellipsoid or ovoid, mostly straight, uniseptate, brown conidia are 17·5 to 22 by 8 to 10 μ.

Among the 16 new records for Portugal may be mentioned *Valsa cenisia* on *Juniperus phoenicea*, *V. pini* [15, p. 408] on pine, *Calospora arausiaca* on oak,

Sphaeronema oleae on olive, *Helminthosporium pseudotsugae* on *Thuja occidentalis*, and *Phyllosticta napi* on cabbage. Also of interest is *Septoria graminum* on wheat.

Lucas (Maria T.) & da Camara (E. de S.). **Fungi Lusitaniae VIII.** [Fungi of Portugal VIII].—*Agron. lusit.*, 16, 2, pp. 81–104, 3 pl., 1954.

The present instalment of the current annotated list of Portuguese fungi [see preceding abstract] contains 13 new species. *Anthostomella lavandulae* n.sp., collected on lavender (*Lavendula stoechas*) twigs, is characterized by elliptical, subepidermal, subclypeal, black perithecia, 455 to 485 by 228 μ; cylindrical, pedicellate, hyaline asci, 123 to 169 by 10 to 13 μ; numerous filiform, hyaline paraphyses, projecting above the asci; and ellipsoid, straight, smoke-brown spores, with a thick, black wall, 15·5 to 20 by 8 to 9 μ. On the same host were found *Pleospora heterophragmia* (in association with *Botryodiplodia mitylospora*) and *P. labiatarum* (a new record for the country), accompanied by *Ophiobolus rudi* and *Sphaeropsis sideriti*.

Dothiorella cisti n.sp. produces on twigs of *Cistus ladaniferus* round or ellipsoid, intensely black pycnidia, 170 to 228 by 115 to 142 μ; subconical or cylindrical, fasciculate, hyaline conidiophores, 8 to 9 by 3 to 4 μ; and ellipsoid or clavate, straight, hyaline conidia, 15·5 to 22 by 5 to 6·5 μ. *Phoma cisti*, one of the 39 species new to the country, was collected on the same host. *Phyllosticta limonum* n.sp. forms apical or marginal, irregular, large, grey, chestnut-bordered lesions on lemon leaves; the subglobose or ellipsoid, fuliginous pycnidia measure 115 to 170 by 83 to 142 μ and the extremely numerous cylindrical, straight, biguttulate, hyaline spores 5 to 9 by 2·5 to 3 μ.

The black pycnidia of *Dichomera ripidiomorpha* on *Mesembryanthemum* sp., 228 to 513 by 170 to 400 μ, are arranged in the shape of a fan; the cylindrical, erect, hyaline conidiophores are only up to 11 μ in length; and the ellipsoid or ovoid, rarely cylindrical, straight, brown conidia, 13 to 18 by 6 to 9·5 μ, are longitudinally uniseptate and furnished with three or sometimes four transverse septa. *Haplographium chlorocephalum* was observed on the same host for the first time in Portugal.

Other new records for the country include *Sphaerella menthae* on *Rosmarinus* sp., *Cytospora exigua* on olive, *C. cisticola* on *Cistus ladaniferus*, *Cytospora syringae* var. *brevipes* on lilac, *Dothiorella vulgaris* on ivy, *Phomopsis occulta* [32, p. 62] on *Taxodium distichum*, and *B. juglandicola* and *Gloeosporium epicarpii* on walnut.

Also of interest are *Uromyces scillarum* on *Urginea maritima*, *Anthostomella limitata* on *Asparagus plumosus*, *Dothiorella berengeriana* together with *Diplodina ventricosa* on *Acacia tomentosa* and *Celtis orientalis*, *Phoma hederacea* on ivy, *Phomopsis* [*Diaporthe*] *citri* and *Diplodia aurantii* on orange, *Colletotrichum gloeosporioides* on lemon, *P. leptostromiformis* on yellow lupin, and *P. depressa* on lilac.

Imler (L.). **Une mise au point sur ma conception de la variété en mycologie.** [A clarification of my concept of variety in mycology.]—*Bull. Soc. mycol. Fr.*, 69, 3, pp. 343–349, 1953.

The author puts forward the view that a variety in mycology is recognizably distinct from the species type and discusses examples from the higher fungi in which the mycelium is a separate growth; the colour plainly different, and of a stable, heritable quality; and there is a difference in chemical composition, shown by a different range of coloration.

Moreau (F.). **Les tendances actuelles de la systématique des champignons.** [Present trends in systematic mycology.]—*Bull. Soc. bot. Fr.*, 101, 5–6, pp. 282–326, 1954.

The author discusses the principles of the systematics of fungi under the headings:

I, analogy and homology: the conceptions of the ring, the volva, and paraphyses, and of the 'sporangia' of the Mucorales; and the phenomena of convergence; II, the value of certain taxonomic criteria: the morphological, chemical, biochemical, and biological; and III, the great phylogenetic lines of the fungi.

The author concludes that in their effort to establish affinities mycologists tend to depart from consideration of the morphological features only of the mature sporophores, and include also the history and development of their various parts; and that they tend to discard analogy as deceptive, and to rely more exclusively on homology.

Arnaud (G.). **Mycologie concrète : Genera II (suite et fin).** [Concrete mycology: genera II (continuation and conclusion).]—*Bull. Soc. mycol. Fr.*, 69, 3, pp. 265–306, 16 figs., 1953.

In this important contribution to the present series [*R.A.M.*, 32, p. 511] the author summarizes his concept of the Dematiaceae, of which a very large number of genera are briefly described and excellently figured. Over 30 new genera and over 60 new species are dealt with [without Latin diagnoses].

Gäumann (E.). **Sur trois rouilles nouvelles pour la France.** [On three rusts new to France.]—*Rev. Mycol., Paris*, 18, 3, pp. 181–185, 2 figs., 1953.

A description is given of *Puccinia tendae* n.sp., collected on *Thymus vulgaris* in 1953 near Tende (Alpes Maritimes). Aecidia of *Schroeteriaster alpinus* were identified on *Ranunculus grenerianus*, *R. lanuginosus*, and *R. radicescens*.

Malençon (G.). **Le Coniodyctium chevalieri Har. et Pat., sa nature et ses affinités.** [*Coniodyctium chevalieri* Har. & Pat., its nature and affinities.]—*Bull. Soc. mycol. Fr.*, 69, 1, pp. 77–100, 9 figs., 1953.

A study of the morphological and biological characters of *Coniodyctium chevalieri* on *Zizyphus mucronata* from Africa demonstrated that the reproductive organs are basidia with basidiospores, not conidiophores and conidia as had previously been thought. Thus, the fungus, previously regarded as a hyphomycete, is now shown to be a rust, and an emended diagnosis is given of the genus. In view of their natural affinities the genera *Botryoconis* (=*Cryptobasidium* Lendner), *Clinoconidium*, *Coniodyctium* (= *Hyalodema* P. Magnus), and *Drepanoconis* are brought together into a new family, Cryptobasidieae G. Malençon *fam. nov.*

Edward (J. C.). **Macrophomina and Botryodiplodia, two distinct genera of Sphaeropsidaceae.**—Reprinted from *Allahabad Fmr*, 28, 4, 5 pp., 9 figs., 1954.

In studies at the Agricultural Institute, Allahabad, India, the author used two similar isolates of *Botryodiplodia* sp., one from roots of a dead *Citrus* sp. and the other from diseased roots of a mango seedling, the former producing typical pycnidia and spores in culture. These isolates were then compared with a typical culture of *Macrophomina phaseoli* [*R.A.M.*, 33, p. 451], isolated from red gram [*Cajanus cajan*], by soil inoculation of French bean (*Phaseolus vulgaris*) seedlings, on which *M. phaseoli* characteristically produces its pycnidia. All three inoculants produced pycnidia on the dead host. Those of *M. phaseoli* were identical with those on authentic material examined and were smaller, paler, and more membranaceous than those of *Botryodiplodia* sp.; the pycnidiospores were continuous, hyaline, thin-walled, and with a length to breadth ratio of 3:1 in contrast to the bicellular, coloured, thick-walled spores of *B.* sp. with a ratio of 2:1.

All three isolates induced rot in potato tubers [loc. cit.; 34, p. 480], but infection by *B.* sp. was quicker and more severe. The author considers that the *B.* isolates are similar to the fungus described by Thirumalachar [33, p. 451] and that the transfer of *M. phaseoli* to *Botryodiplodia* recommended by him is unwarranted.

Dobbs (C. G.) & English (Mary P.). **Piptocephalis xenophila sp.nov. parasitic on non-mucorine hosts.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 375–389, 1 pl., 3 figs., 1954.

Piptocephalis xenophila n.sp. was found on *Penicillium waksmani* near Bristol in 1941 and on *P. frequentans* in Canada in 1951, both from soil cultures, and was cultured on numerous other ascomycetous moulds with greater success than on the Mucorales. It is quite distinct from other species, particularly in its minute head cell and long spore chains.

Moreau (F.) & Moreau (Mme). **Étude du développement de quelques Aspergillacées.** [Study of the development of some Aspergillaceae.]—*Rev. Mycol., Paris*, 18, 3, pp. 165–180, 3 figs., 1953.

Detailed studies on perithecial development in *Aspergillus ruber*, *Magnusia nitida*, and *Microascus doguetii* n.sp. supported the inclusion of the three fungi in the Aspergillaceae, and the authors emphasize the importance of such studies in the classification of ascomycetes.

Ciferri (R.). **Biology and taxonomy of the Actinomycetes.**—*Atti Ist. bot. Pavia*, Ser. 5, 10, 2–3, pp. 187–199, 1954. [Received 1955.]

The author succinctly reviews and discusses 13 papers on the Actinomycetes read by various workers at the Symposium on the Morphology, Biology, and Systematic[s] of the Actinomycetales held by the Sixth International Congress for Microbiology, Rome, 6th–12th September, 1953.

At present the study of the Actinomycetes [see following abstracts] appears to be rather one-sided. A plea is made for the investigation of the life of these organisms in soil and of the relation of their biochemical activities to their physiology. Recent attempts to clarify the taxonomy and nomenclature are reviewed.

Baldacci (E.), Comaschi (G. F.), Scotti (T.), & Spalla (C.). **General criteria for the systematics of genera and species of Actinomyces (Streptomyces) and Micromonospora.**—*R.C. Ist. sup. Sanit. 1953*, 39 pp., Symposium [on the] Morphology, Biology, and Systematics [of the] Actinomycetales [Rome], 7th to 11th September, 1953. [Received 1955.]

In the first part of this paper the author discusses the various diagnostic interpretations of the genus *Actinomyces* [*R.A.M.*, 34, p. 488 and preceding abstract] and its type species [see next abstract], concluding that it is a valid name.

The second part is devoted to an attempt to classify the species of *Actinomyces* by presenting a key to 21 species, divided at present into two sections on a basis of the colour of the vegetative mycelium, the first colourless, with ten 'series', and the second coloured. These are further subdivided on the colour of the aerial mycelium [34, p. 262].

There is a note on media and standard cultural techniques in an appendix.

Frank (H. A.) & Skinner (C. E.). **The relationship between Actinomyces bovis and Lactobacillus bifidus.**—*Mycologia*, 46, 6, pp. 728–735, 10 figs., 1954.

In studies conducted at the Department of Bacteriology and Public Health, State College of Washington, a typical strain of *Actinomyces bovis*, ATTC *10084*, and seven strains of *Lactobacillus bifidus* obtained from N. F. Norris were compared.

In tubes of thioglycollate medium the colonies formed by *A. bovis* were small, compact, and lobulated. There was no growth in the upper portion of the tube where oxygen penetration was indicated by the colour-change of the resazurin present in the medium. Growth was dispersed throughout the rest of the tube.

Larger colonies tended to develop near the bottom of the tube. The colonies were very difficult to disrupt with an inoculating needle. Strains of this organism showed a somewhat 'pleomorphic' rod which stained irregularly. The morphology was not consistent, variation in size and shape ranging from coccobacillary forms to clavate rods. Many straight, regular rods were also present. Massive clumps occurred very commonly, some short chains were visible, and simple branching was frequent. In tubes of brain–heart infusion medium *A. bovis* typically formed clumps of large, compact, white, lobulated colonies resembling minute cauliflowers. Various morphological types occurred. There were numerous uniform, straight rods, some coccoid forms, and some very pleomorphic ones with bulbous ends. Clumps were common and short chains and simple branching were frequent. Y- and V-shaped pairs were present. In tubes of 'bifid' medium *A. bovis* formed tangled masses of rather straight chains which stained irregularly. Branching, but little 'pleomorphism', was present.

L. bifidus is sufficiently unlike *A. bovis* both in morphological and in fermentation characters clearly to be another species. The anaerobic character and the definite branching of the cells suffice to remove it from the genus *Lactobacillus* and justify its designation as *A. bifidus* (*Trat. Micopat. umana*, (Siena), 4, [p.] 13, 1934.)

There is no described species to which the 'anaerobic diphtheroids' studied could be assigned. They are not identical with *A. bovis* or *A. bifidus*, but seem to be near the former.

In the opinion of C. E. Skinner some actinomycetes, for example the genus *Streptomyces*, are more closely related to the true fungi than they are to certain other actinomycetes [see preceding abstracts], such as *A. bovis*, which in turn is more closely related to the true bacteria. The evidence obtained in the present study tends to confirm this view.

Hagedorn (H.). **Beiträge zur Cytologie und Morphologie der Actinomyceten.** [Contributions to the cytology and morphology of the Actinomycetes.]—*Zbl. Bakt.*, Abt. 2, 108, pp. 353–375, 2 pl., 14 figs., 1955.

The author examines the presence and distribution of desoxyribonucleic acid in *Streptomyces aureofaciens* [*R.A.M.*, 33, p. 745]. A new method, involving the use of Schiff's reagent, diamant fuchsin, and alizarin viridin, stained the nuclei in hyphae and spores; use of the enzyme desoxyribonuclease confirmed the specificity of the colour demonstration and refuted the interpretation of the Feulgen-positive substance as reserve material. The spherical or oval nuclei (diameter about 0·3 μ) most probably divide by abstriction, as dumb-bell shapes were observed. The mode of fission was more easily studied in forms artificially increased by breeding on certain neutral salts, which caused increases in size or in the fission rate, or by inducing the formation of chains or conglomerations of nuclei (nucleoids). Penicillin inhibited cytoplasmatic growth without disturbing the fission rate. The features seen in fixed cells were confirmed *in vivo* by observations with the phase contrast microscope. It was established that actinomycetes have nucleoids (the seat of desoxyribonucleic acid) and that these bodies multiply and distribute themselves in a regular fashion. The assumption that genuine mitosis exists is unwarranted since the spindle-inhibiting toxin colchicin does not interfere with fission. It is concluded that the observations point to a systematic alignment of the actinomycetes with the bacteria.

Rich (A.), Dunitz (J. D.), & Newmark (P.). **Structure of polymerized Tobacco plant protein and Tobacco mosaic virus.**—*Nature, Lond.*, 175, 4468, pp. 1074–1075, 1955.

At the National Institute of Mental Health, Bethesda, Maryland, small differences were observed in the diffraction patterns of virus-free preparations of the

polymerized abnormal protein from tobacco plants infected with tobacco mosaic virus [*R.A.M.*, 32, p. 514] and those of the virus itself, which suggest the possibility of determining the position of the ribonucleic acid in the virus particle [see next abstract].

Franklin (Rosalind E.) & Commoner (B.). **X-ray diffraction by an abnormal protein (B8) associated with Tobacco mosaic virus.**—*Nature, Lond.*, 175, 4468, pp. 1076–1077, 3 figs., 1955.

In further studies at Birkbeck College Crystallography Laboratory, London [cf. *R.A.M.*, 34, p. 551] preliminary X-ray diffraction measurements on the polymerized non-virus protein isolated from tobacco plants infected with tobacco mosaic virus [see preceding abstract] and component B8 [33, p. 265] suggest that the structure of the latter is similar to that of tobacco mosaic virus but is looser. It is concluded that since ribonucleic acid contributes to the birefringence of the tobacco mosaic virus particle then the purine and pyrimidine rings are aligned parallel to the axis. The structure of ribonucleic acid must differ considerably from that already described for deoxyribonucleic acid.

Ruizhkov (V. L.) & Marchenko (N. K.). Влияние некоторых метаболитов на размножение вируса мозаичной болезни Табака. [Influence of some metabolites on reproduction of Tobacco mosaic virus.]—Докл. Акад. Наук СССР [*C.R. Acad. Sci. U.R.S.S.*, N.S.], 98, 6, pp. 1033–1036, 1954.

At the D.I. Ivanovsky Institute of Virology, U.S.S.R. Academy of Medical Sciences, longitudinal halves of tobacco leaves inoculated with tobacco mosaic virus [*R.A.M.*, 32, p. 345] were immersed in various solutions, the corresponding other halves being placed in water. A few days later the virus titre, estimated by inoculation of *Nicotiana glutinosa* leaves, was shown to be increased by malic acid in a series of experiments, by fumaric acid (less than 0·01 M) in four out of five experiments, and succinic acid in one; citric acid sometimes increased and sometimes decreased it, and malonic acid gave a statistically significant decrease in all the experiments. The effect of malonic acid was eliminated by fumaric acid. The results indicate that in starved tobacco leaves the acids, taking part in the Krebs cycle, can in individual cases contribute to the increases in virus content. Increased breakdown of the plant tissue by these acids results in physiological conditions favourable to virus reproduction.

In experiments on the influence of vitamins on the development of tobacco mosaic virus the stimulating effect of folic acid [vitamin Bc] (*C.R. Acad. Sci. U.R.S.S.*, 86, 3, 1952) was confirmed. Pyridoxine [vitamin B6] stimulated the reproduction of the virus slightly, but was inconstant in its effect. Nicotinic acid amide severely depressed and both pyrimidine and thiazole inhibited virus reproduction.

Hopkins (J. C. F.). **Investigation into Alternaria disease of Tobacco.**—*Nyasald Farm. & For.*, 2, 4, pp. 30–33, 1955.

Following a brief visit in January, 1955, to Nyasaland to investigate the epiphytotic of *Alternaria longipes* on tobacco [*R.A.M.*, 32, p. 669], the author is of the opinion that the disease may be controlled by improved cultural practices rather than by the use of fungicides. No attempts appear so far to have been made to breed resistant varieties. Control recommendations include growing tobacco for one year only and following with crop rotations, destroying all tobacco-plant debris and removing volunteer plants, using a fertilizer with a phosphorus and potassium to nitrogen ratio correctly balanced to soil type, and the early harvesting of all leaves, whether ripe or not, exhibiting *Alternaria* spots.

Canova (A.). **A deformity of Tomato fruit due to virus infection in Italy.**—*F.A.O. Pl. Prot. Bull.*, 3, 2, pp. 17–19, 2 figs., 1954.

Tomato fruits grown in the coastal region of the Marches area of central Italy, between Pesaro and San Benedetto del Tronto, have been affected for some years by a malformation which causes highly significant losses. In some varieties, particularly Comet, 10 to 15 per cent. of the fruits are generally affected, but incidence may be over 50 per cent. According to information received from the Institute of Foreign Commerce (I.C.E.), a similar disorder appears to be prevalent in Sicily, especially in the province of Syracuse, where the losses are even higher than in the Marches.

When healthy tomato plants were mechanically inoculated with juice from affected fruits characteristic symptoms resulted, and the condition appears to be caused by a strain of tobacco mosaic virus closely related to that responsible for internal browning of tomatoes [*R.A.M.*, 29, p. 64]. Further work is in progress.

De Fremery (D.) & Knight (C. A.). **A chemical comparison of three strains of Tomato bushy stunt virus.**—*J. biol. Chem.*, 214, 2, pp. 559–566, 1955.

Three strains of tomato bushy stunt virus, obtained from R. L. Steere [*R.A.M.*, 28, p. 251] and selected for their widely differing effects (severe, moderate, and mild) on *Datura stramonium* [15, p. 264], were highly purified and analysed for their nucleic acid and protein composition at the Virus Research Laboratory, University of California, Berkeley.

The nucleic acid content, about 16·5 per cent., and its nucleotide composition were found to be uniform for all the strains, while the protein-bound pentose was identified in each case as ribose. No decisive differences were found, moreover, between the protein moieties, analysed by the Moore and Stein technique of ion exchange column chromatography (*J. biol. Chem.*, 176, p. 367, 1948), supplemented by colorimetric procedures. Hence it is concluded that the amino acid compositions of the three strains are closely similar if not identical.

Treshow (M.). **The etiology, development, and control of Tomato fruit tumor.**—*Phytopathology*, 45, 3, pp. 132–137, 4 figs., 1 graph, 1955.

Tumours frequently occur on 10 to 20 per cent. of tomatoes of the Pearson, Pearson Shipper, Earliana, and Early Pak varieties in southern California as a result of wounds caused by rough handling in packaging operations. Not only do the tumours disfigure the fruits, but they may also provide channels of ingress for certain fungi causing decay. Tumour formation was independent of cuticle thickness, being governed to a large extent by the state of maturity of the cells. The rate of formation increased with rising temperature.

Effective control may be obtained by allowing the green fruits to ripen at 18° C. supplemented by care in picking and packaging.

Outbreaks and new records. Italy.—*F.A.O. Pl. Prot. Bull.*, 3, 1, pp. 11–12, 1 fig., 1954.

A. Ciccarone reports that tomato grey leaf spot (*Stemphylium solani*) [cf. *R.A.M.*, 34, pp. 189, 493], previously unrecorded in Italy, has been identified during the past few years in various parts of the peninsula and in Sicily. It was first observed in 1950 at Fiumicino, near Rome, and in 1951 it occurred round Naples. In 1954 outbreaks of economic importance were reported from eastern Sicily. As the disease does not appear until September or later, it is able to cause serious losses only in Sicily, where tomatoes, commonly grown in the coastal regions, do not ripen until November or December. In October, 1952, tomatoes growing at Scafati, near Naples, were affected by stem and petiole spot caused by *Myrothecium roridum* [cf. 33, p. 655], this being the first record of the fungus in Italy. In September,

1954, tomato plants growing near Parma were affected by a disease which is probably single-virus streak [strain of tobacco mosaic virus: 22, p. 500].

Bagchee (K.), Puri (Y. N.), & Bakshi (B. K.). **Principal diseases and decays of Oaks and other hardwoods in India—II.**—*Indian Phytopath.*, 7, 1, pp. 18–42, 3 pl., 19 figs., 1954. [Received 1955.]

This further contribution to this series [cf. *R.A.M.*, 31, p. 409] includes 37 fungi found on hardwoods in the Himalayas and other parts of India. Notes are given on morphology, growth in culture, and cultural characters.

White spongy rot is caused by *Daedalea flavida* and *Polystictus hirsutus*, both common destroyers of hardwoods all over India. *Fomes sanfordii*, a new record, found in the Himachal Pradesh, causes a white, spongy rot with dark brown lines on *Lonicera* spp. White fibrous rot is produced by *Lenzites betulina* and *Polyporus consors* on oaks, the latter a new record in India, found in U[ttar] P[radesh] and the Punjab.

Fomes ostricoloris, and *F. scruposus*, new records, both found at Kulu in the Punjab, produce a white fibrous rot with dark brown zone lines, the former on *Rhus wallichii* and *Corylus colurna*, the latter on *Prunus padus*. The white fibrous rot produced by *Trametes mollis* has black zone lines; it was found at Sungri, Himachal Pradesh, on *Quercus semecarpifolia*.

Polyporus adustus, found at Mundali, Uttar Pradesh, produces a similar rot on sal [*Shorea robusta*], and was found on several hard and soft woods. *F. pinicola* is uncommon on oak, though common on conifers.

White pocket rot was caused by *F. setulosus* on *Mallotus philippinensis* in the district of Wynad in South India; by *Hymenochaete tabacina* and *Peniophora filamentosa* on *Q. dilatata* in the U[ttar] P[radesh], both new records; and by *H. villosa* on *Q. incana* at Kulu, Punjab. *H. rubiginosa* occurred on oaks in the Himachal Pradesh, where it caused a severe pocket rot.

Percentage weight losses induced in four months in sal sapwood [33, p. 695] were: by *Lenzites betulina* 37, *F. senex* (found on oaks) and *Polyporus adustus* 21, *P. consors* 20, *Merulius tremellosus* (on oaks) 18, *F. sanfordii* 16, *Ganoderma lucidum* (from *Q. semecarpifolia*), *L. eximia*, *Stereum hirsutum*, and *Polystictus hirsutus* 13, *F. ostricoloris* and *Hymenochaete rubiginosa* 11, *D. flavida* 10, *P. versicolor* (on oaks) 9, *Peniophora filamentosa* 8, *Fomes rimosus* (common on oaks) 6, and *H. tabacina* 5; *F. pinicola* caused a weight loss of 54 per cent. in chir [*Pinus longifolia*] sapwood in the same period, compared with 8 per cent. by *F. annosus* from living roots of *Q. incana*. Other records were *Inonotus nothofagi* and *L. palisoti* on oaks.

Waid (J. S.). **Occurrence of aquatic hyphomycetes upon the root surfaces of Beech grown in woodland soils.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 420–421, 1954.

Clathrosphaerina zalewskii (*Trans. Brit. mycol. Soc.*, 34, pp. 280–290, 1951) and *Varicosporium elodeae* (*Pap. Mich. Acad. Sci.*, 35, pp. 15–17, 1939) were isolated by root washing at the University Department of Botany, Oxford, during 1952 from the root surfaces of beech seedlings which had grown in beechwood soils at Bagley Wood and Shotridge Wood, Berkshire. Previous isolations of these fungi were from submerged leaves of broad-leaved trees and shrubs decomposing in fresh water. It is suggested that aquatic hyphomycetes may be active in various other soil sites.

Vanderwalle (R.). **Note sur l'étiologie du chancre du Peuplier.** [A note on the etiology of Poplar canker.]—*Parasitica*, 9, 4, pp. 119–124, 1953.

Inoculations of poplar trees at the State Phytopathological Station, Gembloux, Belgium, by wounding a branch with five gramophone needles soldered together and then syringing into the holes a suspension of canker extract in sterile water,

regularly gave typical poplar cankers. Inoculations with pure cultures of specific organisms isolated from the exudate or from cankerous substrate failed to reproduce the condition. When young poplar seedlings of different species were inoculated with exudate 'tyndalized' by three successive heatings to 60° C. there was no particular reaction. The filtrate of the exudate after passage through a filter candle or a collodion membrane caused swelling of the tissues at the inoculation site in some trees, and depressions, sometimes accompanied by necrotic rings, in others. This variable effect may be the result of a toxic concentration or a specific reaction of the inoculated host. The precipitate from either filter was unable to cause the development of true cankers. There was, however, some necrosis round the inoculation site, but the wounds soon healed. It would seem that the formation of cankers in nature is associated with one or more organisms present in the lesions, but successful inoculation also requires the presence of toxins derived from poplar sap acted upon by the microflora present in the sap.

Glaser (T.). **Rzadko spotykana forma koralowa grzyba Fomes applanatus (Pers.) Wallr. forma coralloides, f. nova.** [A rarely met coralloid form of the fungus *Fomes applanatus* (Pers.) Wallr. forma *coralloides*, f. nova.]—*Acta Soc. Bot. Polon.*, 22, 4, pp. 805–810, 2 figs., 1953. [English summary.]

Fomes applanatus f. *coralloides* n.f. [a form of *Ganoderma applanata*], was found on a dead trunk of Canadian poplar (*Populus canadensis*) in the vicinity of Poznań, Poland, in 1949. The sporophore, 20 cm. in diameter by 16 cm. high, was irregularly saucer-shaped at the base, with a central attachment, the hymenium being borne on numerous clavate, folded projections, sometimes fused together and shortly branched on the top.

Minev (K.). Болести на дивата Фоја **Juniperus excelsa, Bieb.** [Diseases of Junipers, *Juniperus excelsa* Bieb.]—*Annu. Fac. Agron. Silvicult. Skopje*, 4 (*1950–51*), pp. 41–45, 6 pl., 1953. [English summary.]

Juniperus excelsa trees in Macedonia, Yugoslavia, are attacked by *Gymnosporangium sabinae* [*R.A.M.*, 34, p. 116] and *Fomes juniperinus* [32, p. 527], the latter causing severe heart rot of living trunks.

Minev (K.). Болести на Борот **(Pinus peuce, Griseb.)** и Елата **(Abies alba, Mill.)** во шумата на националиот парк Пелистер. [Diseases of Pine (*Pinus peuce* Griseb.) and Fir (*Abies alba* Mill.) in the Pelister National Park.]—*Annu. Fac. Agron. Silvicult. Skopje*, 4 (*1950–51*), pp. 23–40, 18 pl., 1953. [English summary.]

The diseases found on *Pinus peuce* in the Pelister National Park, Macedonia, Yugoslavia, include *Fomes pini* [cf. *R.A.M.*, 32, p. 44] and witches' brooms of unknown origin. Those on *Abies alba* include *Melampsorella caryophyllacearum* [cf. 27, p. 115; 34, p. 116].

Björkman (E.). **The occurrence and significance of storage decay in Birch and Aspen wood with special reference to experimental preventive measures.**—*Skr. Skogshögsk. Stockh.*, *1953*, 12–19, pp. 53–90, 13 figs., 4 graphs, 1953. [Swedish summary.]

In the course of studies covering the period from 1947 to 1951 the principal fungi concerned in the decay of forest-stored birch and aspen logs in Sweden were *Polyporus zonatus* [*R.A.M.*, 32, p. 224], which is particularly aggressive, *Stereum purpureum* (the most common on aspen), *S. hirsutum*, *Corticium evolvens* [25, p. 146], and *Daedalea unicolor*, all present throughout the country. *P. hirsutus*, *P.* [*Polystictus*] *versicolor*, and *Schizophyllum commune* are mainly confined to the

south. All the organisms cause a white rot, utilizing the lignin components of the wood.

The results of cooking tests on birch stored in the forest for varying periods showed that the damage caused by one year's decay is virtually negligible, but after two and three years the decreases in yield from this source may amount to 5 and 10 to 20 per cent., respectively, while the strength of the pulp is also markedly impaired. In the case of aspen the reduction in yield from decay is only about half as heavy as in birch.

Clean-barking [34, p. 418] in the forest is recommended for birch and aspen pulpwood intended for two or more years' storage. Barking in strips may also be practised where the site of the storage depot is reasonably open with good drying facilities, and the same method may be applied after the arrival of the logs at the pulpwood yard. Unbarked birch and aspen wood (especially the former) is liable to substantial decay, which does not, however, extend more than $\frac{1}{2}$ m. from the ends during the first two years.

The results of laboratory experiments demonstrated the efficiency in the control of *S. purpureum*, *S. hirsutum*, and *Polyporus zonatus* of various chemicals, including hylosan and basileum, especially when used in conjunction with an anti-leaching preparation, such as modocoll. In large-scale trials with aspen wood at a timber yard of the Swedish Match Company (the party most interested in proper storage arrangements), spraying the log ends with 10 per cent. permatox [cf. 31, p. 141], hylosan PE, fluralsil [15, p. 546 *et passim*], and ambrite (an American chlorophenol compound) reduced the volume of decayed sapwood on an average from 90 to 75 per cent. at the ends themselves and from 45 to 32 per cent. at a distance of about 34 cm. from them, while sporophore production was almost entirely prevented. In preliminary tests in 1953 the application of an osmotic fungicide, antrosit B, to the log ends with a brush immediately after felling gave even better results.

[An abridged version of this paper by A. Tuovinen appears in *Paperi ja Puu*, 37, pp. 36–41, 1955, in Finnish with an English summary.]

Mulholland (J. R.). **Changes in weight and strength of Sitka Spruce associated with decay by a brown-rot fungus, Poria monticola.**—*J. For. Prod. Res. Soc.*, 4, 6, pp. 410–416, 3 graphs, 1954. [Received July, 1955.]

At Yale University School of Forestry, New Haven, Connecticut, a study was made of the effects of early decay by *Poria monticola* [*R.A.M.*, 33, p. 392] on certain physical properties of Sitka spruce [*Picea sitchensis*]. Test pieces measuring $\frac{1}{4}$ by $\frac{1}{4}$ by $4\frac{1}{2}$ inches, a size convenient for handling, were decayed evenly by exposure to pure agar cultures of *Poria monticola*. After two weeks the average weight loss was only 2·03 per cent., but a highly significant loss in strength had occurred, showing that too broad a classification, based on weight loss, of the durability of timber affected by brown rot is dangerous when the timber is to be used in places where strength is important.

Lindgren (R. M.) & Wright (E.). **Increased absorptiveness of molded Douglas-Fir posts.**—*J. For. Prod. Res. Soc.*, 4, 4, pp. 162–164, 3 figs., 1954. [Received June, 1955.]

At the Forest Products Laboratory, Madison, Wisconsin, absorption of an oil preservative by Douglas fir [*Pseudotsuga taxifolia*] posts stored under slow drying conditions was three to five times greater in posts artificially moulded by *Trichoderma* [*viride*: *R.A.M.*, 32, p. 527 and following abstract] than in bright posts. The increased permeability of moulded wood was induced by the partial or complete breakdown of wood rays, thus providing entry through the sapwood.

Graham (R. D.). **The preservative treatment of Douglas-Fir post sections infected with Trichoderma mold.**—*J. For. Prod. Res. Soc.*, 4, 4, pp. 164–166, 1 fig., 1954. [Received June, 1955.]

At the Oregon Forest Products Laboratory, Corvallis, post sections of Douglas fir [*Pseudotsuga taxifolia*], bulk piled when green and covered, were as heavily moulded, chiefly by *Trichoderma* [*viride*: see preceding abstract], as those sprayed with sodium fluoride to stimulate mould development. When treated with preservative by the soaking, hot-cold bath, and pressure processes, moulded posts retained twice as much preservative, which penetrated to a greater depth and was more evenly distributed than in unmoulded posts.

Zabel (R. A.). **Variations in preservative tolerance of wood-destroying fungi.**—*J. For. Prod. Res. Soc.*, 4, 4, pp. 166–169, 1954. [Received June, 1955.]

In a series of laboratory tests, using blocks of *Pinus ponderosa* sapwood 0·25 by 1·25 by 1·75 in., the resistance of three fungi, *Lenzites trabea* (Madison 617), *Lentinus lepideus* (Madison 635), and *Poria monticola* (Madison 575) to pentachlorophenol, copper naphthenate, phenyl mercury oleate, and creosote was evaluated. The test fungi showed considerable variation in resistance to these preservatives. The threshold retention value of pentachlorophenol for *Lenzites trabea* was 0·224 lb. per cu. ft. compared with less than 0·168 for *P. monticola* and 0·133 for *Lentinus lepideus*. *P. monticola* was strongly resistant to copper naphthenate, not being inhibited by 0·093 lb. per cu. ft., while *L. lepideus* was inhibited by 0·035 lb. and *Lenzites trabea* by 0·047 lb. For phenyl mercury oleate the figures were 0·0071 lb. per cu. ft. for *L. trabea* and 0·0058 lb. for *P. monticola*, while *Lentinus lepideus* caused no decay at the lowest concentration tested, 0·0032 lb. Considerable resistance to creosote was displayed by *L. lepideus*, a retention of 6 lb. being necessary to prevent decay, while *P. monticola* and *Lenzites trabea* were inhibited by 3·6 lb. It is concluded that laboratory evaluations of timber preservatives should be carried out with several test fungi, which should be selected on the basis of economic importance in decaying the type of wood under investigation.

Meyer (J.). **Multiplication des stomates sous l'action du Peronospora parasitica (Pers.).** [Multiplication of stomata under the influence of *Peronospora parasitica* (Pers.).]—*Bull. Soc. bot. Fr.*, 102, 1–2, pp. 6–9, 2 figs., 1955.

Peronospora parasitica [*R.A.M.*, 34, p. 199] caused a multiplication of stomata on the peduncles of radish [in France]. Sometimes only the guard cells increased, forming three or four pores, but sometimes the surrounding cells also were duplicated.

Savary (A.). **Maladie du cœur ou maladie vermiculaire de la Betterave?** [Heart rot or eelworm disease of Beet?] –*Rev. rom. Agric.*, 9, 8, pp. 64–65, 4 figs., 1953.

The author gives a brief account of the symptoms and control in French-speaking Switzerland of sugar beet heart rot due mainly to boron deficiency [cf. *R.A.M.*, 32, pp. 55, 56], and distinguishes it from the rotting due to eelworm (*Ditylenchus* spp.) infestation.

Roland (G.). **Sur l'emploi des insecticides systémiques contre les pucerons vecteurs du virus de la jaunisse de la Betterave (Beta virus 4, Roland et Quanjer).** [On the use of systemic insecticides against the aphid vectors of the Beet yellows virus (*Beta* virus 4, Roland & Quanjer).]—*Parasitica*, 9, 4, pp. 125–131, 1953. [English summary.]

In an experiment carried out at the State Phytopathological Station, Gembloux,

Belgium, fodder beets in a glasshouse were sprayed with pestox III and systox at 0·065 per cent. one hour to 8 days (14 days in the case of systox) before five *Myzus persicae* individuals raised on a beet affected by yellows virus [*R.A.M.*, 31, p. 159; 33, p. 131; 34, p. 209] were placed on each. Both materials rapidly killed off the aphids, but every treated beet became infected. The use of these products will, therefore, not reduce the percentage of affected beets in a field unless the number of viruliferous aphids visiting the field is insufficient to inoculate every plant.

Brien (R. M.) & Jacks (H.). **French-Bean rust (Uromyces appendiculatus) in New Zealand.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 3, pp. 280–284, 4 figs., 1954.

Rust (*Uromyces appendiculatus*) on French bean [*Phaseolus vulgaris*: *R.A.M.*, 33, p. 53] was first recorded in New Zealand in April, 1951, on the Sydney Wonder, Kentucky Wonder, and Fardenlosa varieties in the Auckland district. The disease appeared again in March, 1952, on Fardenlosa and Market Wonder in the Mangere area, but infection was slight on the whole, though the foliage of some crops was severely damaged and yields greatly reduced. Symptoms, factors favouring the infection and spread, control [24, p. 173], and the morphology of the fungus are here described. Of the 40 varieties tested for resistance in 1953, Westralia [34, p. 425] was highly resistant and Fullgreen (a dwarf variety from the United States) resistant, the remainder being either susceptible or highly so. In preliminary tests, lime-sulphur (1–150) plus colloidal sulphur (2 lb. per 100 gals.) gave effective control. On late crops applications should be made when the plants are established and repeated up to three or four times at 10 to 14-day intervals.

Jacks (H.). **Screening tests with fungicides for control of Broad Bean rust.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 3, pp. 274–279, 1954.

In three glasshouse tests at the Plant Diseases Division, Auckland, New Zealand, 33 fungicides were tested for the control of broad bean rust (*Uromyces fabae*) [*R.A.M.*, 33, p. 369]. Two-week-old Yates Early Longpod bean plants (one per pot) were thoroughly wetted by spraying with 50 ml. of the fungicidal suspension and inoculated 24 hours later with a spore suspension of *U. fabae* containing 25,000 to 30,000 spores per ml. They were then kept in a humidity cabinet (88·5± 3·5 per cent. relative humidity at 65·7°±1·5° F.) for 24 to 36 hours before transfer to a glasshouse at 75·7°±2·6°. The mean number of lesions per leaf on four lower leaves of four plants 10 to 14 days after inoculation was nil for lime-sulphur (0·75 gal. per 100 gals. water), lime-sulphur (0·5 gal.) plus colsul 40 (2 lb.), colsul 40 (10 lb.), cosan (5 lb.), dithane Z-78 (4 lb.), fermspray (5 lb.), manzate (0·5 lb.), and phygon XL (0·25 lb.), and 0·3 or less for thirospray (4 lb.), fuclasin ultra (2 lb.), flit 406 (50 per cent. captan: 2 lb.), and spergon wettable powder (0·5 gal.). Leaves sprayed with water only bore a mean of 295·8 lesions.

Sechet (M.). **Un Pleospora parasite des feuilles d'Arachide.** [A *Pleospora* parasitic on Groundnut leaves.]—*Oléagineux*, 10, 6, p. 414, 1 fig., 1955.

On groundnut leaves from the Agronomic Station at Lake Alaotra, Madagascar, well-defined marginal desiccation was frequently observed, the affected tissues changing to a light brown, which sharply contrasted with the green of the healthy parenchyma. Perithecia appeared as a multitude of minute black spots, slightly erumpent on both sides of the blade. They were spherical, varying from 50 to 120 μ in diameter (average 95 μ), and contained eight to 20 asci, each with eight irregularly disposed ascospores. At maturity these are pale yellow, oblong or oval, measuring 21 to 27 by 8 to 12 (average 24 by 10) μ and having usually three or four, rarely five, transverse septa, and one, two, or no longitudinal ones.

A new species, *Pleospora crassiasca*, is proposed.

Govindo Rao (P.) & Gopala Raju (D.). **Wilt of Talinum triangulare Willd., caused by Pythium aphanidermatum (Eds.) Fitz.**—*Sci. & Cult.*, 20, 10, pp. 502–503, 1955.

A wilt, characterized by discoloration of the outer stem surface 1 to 2 in. above the soil level and a clearly demarcated, swollen, water-soaked area, was observed in August, 1954, on *Talinum triangulare* plants at the Agricultural College, Bapatla, Andhara State, India, where the plant, valuable as a green vegetable and rapidly becoming popular, was first introduced in 1952. The affected plants wilt and fall over within a week. *Pythium aphanidermatum* and a *Fusarium* species were isolated from the infected plants. In pot inoculations the former produced 100 per cent. infection after 11 days and was reisolated, while the latter was not found to be pathogenic.

Lister (R. M.) & Thresh (J. M.). **A mosaic disease of leguminous plants caused by a strain of Tobacco mosaic virus.**—*Nature, Lond.*, 175, 4467, pp. 1047–1048, 1955.

In the course of investigations at the West African Cacao Research Institute Substation, Moor Plantation, Ibadan, Nigeria, a systemic mosaic virus was found in cowpea and Bengal bean (*Mucuna aterrima*), causing leaf distortion and light and dark green mottling varying in severity. These symptoms have been recorded in these hosts since 1941 at the Plantation and on several farms of the Department of Agriculture in western and northern Nigeria. The virus was readily transmitted by sap inoculation, that from cowpea producing systemic mosaic in the 14 varieties of French bean (*Phaseolus vulgaris*) tested, in contrast with the Institute's stock strain of tobacco mosaic virus, which produced discrete local lesions on some varieties but no systemic symptoms. At Rothamsted Experimental Station a purified preparation was precipitated specifically with an antiserum prepared against the stock strain of tobacco mosaic virus there, and the electron microscope revealed the presence of rod-shaped particles varying in length and indistinguishable from the particles of strains of tobacco mosaic virus previously examined.

Bitner (K.). **Grzyby jako pasożyty grzybów kapeluszowych.** [Fungi as parasites of cap fungi.]—*Acta Soc. Bot. Polon.*, 22, 4, pp. 689–722, 13 figs., 1 map, 1953. [English summary.]

Fungi observed on the fruiting bodies of higher fungi in Poland during a field survey in 1950–51 included the following of economic importance: *Hypomyces ochraceus* on *Russula* and related species, *H. chrysospermus* on *Boletus* sp., *H. linkii* on species related to *Amanita* and *Lepiota*, and *H. lateritius*, a common parasite of *Lactarius deliciosus* in Warsaw shops, on *Lactarius* sp.

Sugihara (T. F.) & Humfeld (H.). **Submerged culture of the mycelium of various species of Mushroom.**—*Appl. Microbiol.*, 2, 3, pp. 170–172, 4 figs., 1954.

At the Western Utilization Research Branch, Albany, California, 23 strains of 20 species of edible fungi were grown successfully in submerged culture [*R.A.M.*, 32, p. 467], two types of mycelial growth being obtained, namely, a pellet-like form by *Agaricus* [*Psalliota*] *rodmanii*, *Cantharellus cibarius*, *Lepiota procera*, and two *Morchella* spp. among others, and a dispersed form by one cream and two white varieties of the cultivated mushroom, *Coprinus comatus*, *Tricholoma nudum*, *Armillaria mellea*, and *L. rachodes*.

The main problem remaining to be solved before the process can be carried out commercially is that of the development in the mycelium of a 'mushroom flavour' of sufficient intensity and consumer acceptability. Of the species tested, only the cultivated mushroom and *L. rachodes* had such a flavour.

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